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Executive Function and Theory of Mind: Implications for Individuals With Acquired Brain Injury

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**A thesis submitted in partial fulfilment of the requirements for the degree of
Doctor of Clinical Psychology**

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Declaration

The literature review paper was conducted under the supervision of Dr Ian Hume and Dr Eve Knight. Authorship of the published paper will be shared with them.

The empirical paper was conducted under the supervision of Dr Ian Hume, Professor Nick Alderman and Dr Eve Knight. Authorship of the published paper will be shared with them.

The research thesis is my own work and has not been submitted for a degree at any other university.

Summary

This thesis focuses on theory of mind (ToM) and executive function (EF).

Psychosocial treatments aimed at enhancing ToM skills are explored. Impairments in ToM in acquired brain injury (ABI) and a possible relationship to performance on tests of EF is investigated.

The literature review explores whether ToM abilities can be enhanced through psychosocial treatments in typically developing children and across various clinical populations. Attention is paid to whether reported improvements found through various approaches, can be generalised to other tasks, or real life situations to indicate whether a conceptual change has occurred. The implications are discussed in terms of future research and clinical implications.

The empirical paper explores whether individuals with ABI can pass ToM tasks and whether this is related to performance on tests of executive function (EF).

Performance is compared and contrasted with neurologically healthy controls.

Findings indicate that individuals with ABI performed significantly poorer than the neurologically healthy group. A limited relationship was found between tasks of ToM and tests of EF. There were no real differences in this relationship between the two groups. The implications are discussed in terms of a need for further research and clinical implications.

The reflective paper explores the role of reflection during the research process.

Reflection is focused on academic and clinical experiences, dreams that occurred during the research process and presentation of participants during data collection.

Application of some of these reflections to clinical practice is discussed.

Chapter 1: Literature Review:

The Efficacy of Psychosocial Treatments to Enhance Theory of Mind Abilities

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instructions to authors

see Appendix A)

Abstract

This review explores the efficacy of psychosocial treatments to enhance theory of mind (ToM) abilities. A systematic review of the published literature was completed. Databases searched were PsychInfo, Web of Science and Medline. Eighteen papers fulfilled the determined criteria. Psychosocial treatments were delivered to typically developing children and clinical populations. The main findings show that ToM abilities can be trained across these groups. Difficulties or lack of exploration of generalising these acquired skills to distant-transfer tasks or to real life situations was specific to client group. The findings are discussed in relation to methodological constraints, clinical implications and directions for future research.

1. Introduction

The term “theory of mind” (ToM) originates from the classic study of Premack and Woodruff (1978). ToM abilities allow the individual to infer the mental states of self and others, in brief; ToM allows reflection on the contents of one’s own and other’s mind (Baron-Cohen, 2000). There have been many theories put forward about the development or acquisition of a ToM (see Carruthers & Smith, 1996). However, this review paper will only explore psychosocial treatments to enhance ToM abilities.

1.1 Operational Definitions

The term 'theory of mind' or 'ToM' shall be used in this paper as it is the most widely used term. Other terms used interchangeably include 'mentalizing' (Corcoran, Cahill & Frith, 1997) or 'mindblindness' (Baron-Cohen, 1995).

Dennett (1978) argues the false-belief task is the fundamental test of ToM abilities. The term 'false-belief' refers to the individuals' belief about a situation (Baron-Cohen, 2000). Individuals can have true or false-belief and may act on their false-belief.

In training studies, researchers use 'close-transfer' and 'distant-transfer' ToM tasks to assess for significant improvements. 'Close-transfer' tasks use the same type of scenario used in the training, assessing whether the participant has learnt to pass the test. 'Distant-transfer' tasks use different scenarios to the training, but are still measures of the same concept, therefore assessing whether conceptual understanding has occurred.

1.2 Theory of Mind Assessments

This is not an exhaustive review of ToM tasks but provides an illustration of the range of commonly used tasks. There are first-order, second-order and higher order ToM tasks. There are different types of first-order ToM tasks, for example the unexpected transfer task, when an object is moved in the character's absence. The individual is asked where the character will look for the object on return. Another example is the unexpected contents tasks, where a container has unexpected contents which the individual is shown (e.g. pens in a Smarties tube).

They are then asked what they originally thought and what someone would think is in the container. Typically developing children have been found to pass first-order false-belief tasks at three years and nine months (Astington & Gopnik, 1991).

Second order false-belief tasks involve embedded mental states (Baron-Cohen, 2000). An example would be the Ice-Cream Van test (Perner & Wimmer, 1985) where a story about two characters is read, or is in pictorial form or is acted out with dolls. In this task the false-belief question is ‘what does John think that Mary thinks...’. Children have been found to pass second-order false-belief tasks at around six to seven years (Perner & Wimmer, 1985).

There are also tests of higher level ToM such as the Faux Pas Recognition Test (Baron-Cohen, O’Riordan, Jones, Stone & Plaisted, 1999).

Earlier development of ToM abilities can also be assessed in other ways. For example, through observation of pretend spontaneous play, seen in children with typical development at 24 months (Baron-Cohen, 2000). A lack of this type of play suggests difficulty in reflecting on one’s own imagination.

1.3 Subsequent Difficulties

Impairments in ToM have been found be correlated with difficulties in social skills (Rowe, Bullock, Polkey & Morris, 2001) resulting in a withdrawal in social contact (Happe, Malhi, & Checkley, 2001). These findings have implications for forming social relationships. Research has found that support networks or

relationships are protective factors in mental health diagnoses (Putnam, 1993). Second-order ToM deficits in individuals with a depressive illness were found to predict a high relapse rate (Inoue, Yamada & Kanaba, 2006). Brain imaging studies have found that the prefrontal cortex plays a role in both ToM (for a review see Stone, 2000) and the pathophysiology of mood disorders (Mayberg, 1997), therefore suggesting a relationship.

1.4 Directions in Research

ToM became an influential approach in understanding some of the difficulties presented by individuals with autistic spectrum disorder (ASD) (Baron-Cohen, 1985). Individuals with ASD commonly present with social communication difficulties and this has been explained as an impairment in ToM. Interest in ToM has spread to researchers working with other clients groups such as learning disabilities (LD) (Ashcroft, Jervis & Roberts, 1999) schizophrenia (Frith & Cocrane, 1996), psychopathy (Blair et al, 1996) and neurological populations such as acquired brain injury (ABI) (Bibby & McDonald, 2005).

1.5 Clinical Needs

Psychosocial treatments enhancing ToM abilities have subsequent implications for improving social skills and forming relationships and thus have further consequences for mental health. Such treatments may also have implications for challenging behaviour. If an individual has difficulty with ToM abilities, the consequence of their behaviour may be unintentional. Consideration of how the behaviour impacts on the person it is being directed to/received by would be difficult for an individual with ToM difficulties (Ashcroft, Jervis & Roberts,

1999). Therefore, training in ToM could be useful in clinical practice to address the interpersonal skills of such individuals.

1.6 Aims

This review will examine psychosocial interventions aimed at enhancing ToM abilities with both typically developing children and clinical populations. It is hoped that this review can outline successful interventions in which ToM abilities can be improved, which can serve as indicators for clinical practice.

2. Method

Articles were searched for on PsychInfo, Web of Science and Medline databases. Inclusion criteria was any article with the words *theory of mind* or *false-belief* or *false-belief* or *mindblindness*, or *mentalising* or *mentalizing*, followed by either *therapy* or *therapies* or *train* or *training* or *program(s)* or *programme(s)* or *group(s)* or *treatment(s)* or *intervention(s)* in the title. Exclusion criteria were any articles that were cited in any section of the Dissertation Abstracts International. As well as any article that was not an empirical paper, or any articles that were not describing psychosocial treatments, medication trials.

Three studies were excluded as they were not treatment/training programmes, one was excluded as it was written in Japanese. A further two were excluded as they were medication trials. Subsequently, eighteen studies were included in this

review (See Appendix B for a table summarising these eighteen empirical papers). What follows is a critical review of these papers.

3. Results

3.1 Teaching Theory of Mind (ToM) to enable individuals to pass ToM tests

3.1.1 Typically Developing Children

Studies have explored the efficacy of teaching typically developing children to pass ToM tasks. These studies have potential theoretical and clinical implications. Theoretically, they could contribute to the debate regarding different theories on how a ToM is acquired. Clinically, they could serve as indicators for therapeutic work with clinical populations presenting with ToM difficulties.

In this review, seven studies explored primarily or secondarily the efficacy of teaching typically developing pre-school children, to pass both close and distant-transfer ToM tasks. All of these studies trained the children on false-belief tasks (Appleton & Reddy 1996; Hale & Tager-Flusberg, 2003; Knoll & Charman, 2000; Melot & Angeard, 2003; McGregor et al., 1998; Slaughter & Gopnik, 1996; Swettenham, 1996).

Corrective feedback was mainly given (Hale & Tager-Flusberg, 2003; Knoll & Charman, 2000; Melot & Angeard, 2003; Slaughter & Gopnik, 1996; Swettenham, 1996), as well as errorless learning techniques (McGregor, et al.,

1998). Appleton and Reddy (1996) provided children with a supportive conversation and expanded on their comments, rather than giving direct feedback.

Five of the seven studies trained the children individually with a trainer (Appleton & Reddy, 1996; Hale & Tager-Flusberg, 2003; Melot & Angeard, 2003; McGregor et al, 1998; Slaughter & Gopnik, 1996), whereas one used a computer task providing feedback (Swettenham, 1996) with the remaining study training the children in a group (Knoll & Charman, 2000).

Appleton and Reddy (1996) used a video with actors, acting out a first-order false-belief task. McGregor et al. (1998) used two sets of dolls, one having Polaroid photographs in slots in their heads to illustrate intention and thought. The remaining studies practised first-order false-belief tasks, with some using props (Knoll & Charman, 2000; Melot & Angeard, 2003; Slaughter & Gopnik, 1996).

All seven studies found training in false-belief led to improved performance on close-transfer false-belief tasks. However, Appleton and Reddy (1996) did not pre-test the children on the close-transfer task. Therefore, it is not known whether these children could or could not pass the task before training.

Knoll and Charman (2000) reported their training did not generalise to distant-transfer tasks. Slaughter & Gopnik (1996) claim their participants were able to pass distant-transfer tasks, but the task used at post-test was similar to the format

of the training. Five of the studies found that typically developing children were able to pass distant-transfer tasks (Appleton and Reddy, 1996; Hale & Tager-Flusberg, 2003; McGregor et al., 1998; Melot & Angeard, 2003; Sweetenham, 1996).

Only one study (Appleton & Reddy, 1996) provided follow up data. This lack of follow up data, is perhaps due to most of the children being on the cusp of developing ToM abilities. There is evidence that development of a ToM can occur at three years and nine months (Astington & Gopnik, 1991), Slaughter and Gopnik (1996) reported mean ages of training groups as being three years and nine months, whereas their control group (who received training on number conservation) had a mean age of three years and seven months. Therefore, it is difficult to ascertain whether the improvement in this experiment was associated with typical development, rather than a training effect. However, they rectified this in their second experiment by using the same age or older children in their control group. They found the training groups performed significantly better than the control group. Training was more effective for the older children. Another three studies had participants older than 3 years and nine months (Knoll & Charman, 2000; Melot & Angeard, 2003; Swettenham, 1996).

No studies explored how the new knowledge achieved through training impacted on everyday life.

3.1.1.1 Summary

To summarise, the studies show that typically developing pre-school children can be taught to pass close-transfer false-belief tasks, with some showing that they can generalise training effects to distant-transfer tasks. This has implications for when exploring ToM in atypical development. Most of the studies have studied children on the cusp of developing ToM knowledge and therefore it is difficult to ascertain how this impacts on the training. This links to Slaughter and Gopnik's (1996) finding that the older children benefited more from the training. Control groups have been a feature of some studies which aids the specificity of the impact the training.

3.1.2 Autistic Spectrum Disorder (ASD) and Pervasive Developmental Disorder-Not otherwise Specified (PDD-NOS)

Baron-Cohen and colleagues have been pioneering in their work exploring ToM in individuals with ASD (Baron-Cohen, Leslie, & Frith, 1985; Baron-Cohen, Leslie, & Frith, 1986). It has been argued that those diagnosed with ASD have a difficulty in understanding other minds which contributes to observed social difficulties. Mesibov (1992) argued that individuals with ASD are a stigmatised group and have fewer opportunities for social relationships, thus impacting on social skills.

Studies have explored the efficacy of training individuals with ASD and Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS) to pass ToM tasks. These studies could provide evidence for how/why ToM is generally impaired in individuals with ASD. Frith, Happe and Siddons (1994) found

correlations between ToM abilities in children with ASD and their social skills in everyday life. Therefore it is clinically important to explore whether a clinical population such as ASD, where there is such a well documented difficulty can be taught to pass ToM tasks.

Six studies in this review explored the efficacy of training individuals with ASD/PDD-NOS to pass ToM tasks. Ozonoff and Miller (1996) ran a social skills group which included conversational skills and role-plays of first and second-order false-belief tasks. Swettenham (1996) used a computer program depicting a first-order false-belief task (as discussed above). McGregor, et al. (1998) used two sets of dolls, one of which had photographs in slots in their head to illustrate intention and thought (as discussed above). Kloo and Perner (2003) had a false-belief group providing training in first-order false-belief tasks with positive and negative feedback provided. Fisher and Happe (2005) used a training programme based on a modified version of thinking about beliefs as “photos in the head” (Sweetenham, Baron-Cohen, Gomez & Walsh; 1996). Gevers, Clifford, Mager and Boer (2006) explored the effectiveness of the ToM-based social cognition training (Steernemann, Jackson, Pelzer, Muris, 1996) with eighteen children with PDD-NOS

Training occurred in individual (Fisher & Happe, 2005; Kloo & Perner, 2003; Swettenham, 1996) or group sessions (Gevers et al., 2006; McGregor et al., 1996; Ozonoff & Miller, 1996). Feedback (Kloo & Perner, 2003; Swettenham, 1996) discussion (Ozonoff & Miller, 1996) or errorless learning (McGregor, Whitten & Blackburn, 1996) were features of some of the training.

Four of the studies found training produced limited (Gevers et al., 2006), or significant improvement in close-transfer false-belief tasks (Fisher & Happe, 2005; McGregor et al., 1996. Swettenham, 1996). In terms of generalisation, Fisher and Happe (2005) found significant improvements on a distant-transfer task. This could be associated with the programme training the children to criterion and being more intensive. Two studies found some improvement on real life behaviours (Fisher & Happe, 2005; Gevers et al., 2006).

However, in the Gevers et al. (2006) study the children had good performance on false-belief tasks prior to treatment and therefore this explains why little improvement was seen.

3.1.2.1 Summary

In summary, the articles reviewed suggest that individuals with ASD can be taught to pass first-order false-belief tasks, but they are generally not able to generalise these skills to distant-transfer tasks or social interactions. These findings are consistent with a wealth of literature suggesting the individuals with ASD have difficulty generalising new skills and knowledge to other settings (Brian, Tipper, Weaver & Bryson, 2003).

3.1.3 Anxiety and Aggression

Gottman, Gonso and Rasmussen (1975) found that children with social skills impairments can appear to have difficulties in attributing mental states. Steernemann et al. (1996) argue that anxious and aggressive children have lower

self worth and tend to have fewer social networks. They argue these children have incompetent or immature social skills. Steernemann et al. (1996) designed a ToM-based social cognition training programme. They examined the efficacy of this program with eight children (age range 6-8 years) presenting with mild social anxiety and aggression. The children in the training group performed better than children in the control groups at post-test and four months follow up on first-order false-belief tasks. Improvement in making friendships and a decrease in being bullied was reported by parents. The control groups were children with education difficulties, behavioural difficulties or children in the mainstream school. It may have been more useful to have a control group of children with social anxiety and aggression so a more direct comparison could have been made. Due to the small sample size, more research is needed.

3.1.4 Adults with Learning Disabilities (LD)

Research has suggested that individuals with LD have social skills difficulties (Greenspan, 1979) and impairments in ToM. (Benson, et al, 1993). A link has been found between ToM impairments and difficulties with social skills (Polkey & Morris, 2001). Researchers have found that ToM difficulties in individuals with LD are associated with a developmental delay rather than an underlying organic disorder (Baron-Cohen, 1991). This proposed underlying reason suggests that ToM deficits in LD could be receptive to training and therefore may have a role in clinical practice.

Ashcroft et al. (1999) explored the efficacy of a programme to train individuals with LD to pass ToM tasks Sixteen adults with LD were included according to

interest and availability. First and second-order ToM tasks were administered pre and post training. Training consisted of pictures of participants' head with thought bubbles, whilst again acting out a false-belief task. The main findings showed a significant improvement on performance on ToM tasks, being maintained at follow up. Half of the participants passed the distant-transfer task (colour change task). However, this task was not administered at pre-test and was perhaps not a 'true' distant-transfer task. A limitation discussed by the authors is that some of the participants did not have a verbal IQ score, when these participants were excluded the training effect was significant. When participants over 50 years of age were excluded, the significance increased on the participants' answers to reasoning questions on ToM tasks following training.

This study does have clear methodological issues (e.g. small sample size, inclusion criteria) but serves as a useful indicator for future research with this client group.

3.1.5 Summary

To summarise, training individuals to pass ToM tasks has been explored in typically developing pre-schoolers, individuals with ASD, PDD-NOS, children with social anxiety and aggression and adults with LD. The main findings suggest that these different populations can be trained to pass ToM tasks but the only real evidence of generalisation to distant-transfer tasks was with typically developing pre-schoolers. There have been methodological flaws rooted in many of these studies such as small sample sizes, age of participants, lack of control groups, lack of or not actual distant-transfer tasks used, lack follow up to

assesses maintenance of the newly acquired skills and assessment of generalisation to everyday activities.

More research is needed to address the methodological flaws. The findings from these studies exploring the efficacy of training in clinical groups are not robust enough yet to become a routine feature of clinical practice.

3.2 Teaching language skills to enable individuals to pass

Theory of Mind (ToM) tests

Milligan, Astington and Dack (2007) conducted a meta-analysis with 104 studies exploring the relationship between language and ToM. This relationship was found to have moderate to large effects, with stronger effects being found between earlier language and later false-belief understanding. de Villiers (2000) argues that knowledge in sentential complements is a necessary precondition for ToM. Sentential complements include verbs of communication e.g. 'said' or verbs of mental states e.g. 'thinks'. In sentential complements the main clause may be true while the embedded clause may be false. Findings about the role of language in ToM development, have been applied to training studies.

3.2.1 Typically Developing Children

Exploring the effectiveness of language training studies to improve ToM abilities in typically developing preschool children, contributes to the theoretical understanding of the relationship between these two functions. Significant improvements in ToM abilities could point to similar research in clinical groups, leading to changes to treatments in clinical practice.

Hale and Tager-Flusberg (2003) and Lohmann and Tomasello (2003) explored whether training linguistic skills led to improved performance on false-belief tasks in 60 and 138 typically developing pre-school children respectively. Hale and Tager-Flusberg (2003) found the sentential complements training led to a significant change on close-transfer false-belief tasks, as well as on distant-transfer false-belief and appearance reality tasks. The results suggested that language plays a role in ToM development but is not a necessary prerequisite. Lohmann and Tomasello (2003) argue that their results showed that language was an essential condition for false-belief understanding. Training in sentential complements was sufficient on its own to improve performance on both close and distant false-belief tasks. Training which incorporated both perspective-shifting and sentential complements, was the strongest predictor of improvement on close and distant-transfer false-belief tasks.

As previously discussed, research has shown that children have been found to pass false-belief tasks at a mean age of three years and nine months (Astington & Gopnik, 1991). In Lohmann and Tomasello's (2003) study, the children making significant progress in the false-belief and sentential complements group had mean ages of three years and eleven months and just over four years respectively. The relative clause group had no significant improvement and a mean age of just over three years and nine months. This may suggest that age and development impacted on the acquisition of ToM abilities rather than it just being the training alone.

3.2.1.1 Summary

These two training studies could have theoretical implications, as they support empirical studies, suggesting a relationship between language (or specifically sentential complements) and acquisition of a ToM, with one suggesting it is not necessary. However, Hale and Tager-Flusberg (2003) query whether the sentential complement training group had improvement on false-belief tasks due to it exposing children to false statements, in contrast to what they had witnessed, rather than the change being about a linguistic structure. This is an important consideration when assessing the developmental relationship between language and ToM.

Hale and Tager-Flusberg (2003) argue their results could not be applied to individuals with ASD as their participants were on the cusp of developing ToM knowledge. The training triggered the acquisition of ToM and showed specific features of language related to ToM sentential complements and not relative clauses. The question therefore, is *how* can this be applied to training clinical populations with ToM deficits.

3.2.2 Autistic Spectrum Disorders (ASD)

Chin and Bernard-Opitz (2000) explored whether a conversation training package with three children with ASD, would improve conversational skills and subsequently improve performance on ToM tests. Five conversation skills were taught: making a conversation, turn-taking, listening, maintaining a topic and changing a topic appropriately. Skills were practiced with a puppet, the trainer and then with the child's care-giver. The children were instructed to talk with

their care-giver whilst being videoed. The children then evaluated their performance (with help). Finally the children were asked to recall skills learnt and to talk about a topic of choice (this was videoed). To encourage maintenance, care-givers were asked to practice at home, rewarding the children when displaying the skills learnt. Generalisation sessions were carried out once the child met acquisition criteria. The main findings showed that conversational abilities improved but there was no improvement on first and second-order false-belief tasks.

Two of the children did not complete all five training components. This meant the generalisation sessions were not carried out with two of the children. As discussed previously generalisation proves difficult with individuals with ASD, so this may have impacted on the findings. More research in this area undoubtedly needs to take place.

3.2.2.1 Summary

To summarise, in typically developing children, training in language led to improved performance in close and distant-transfer tasks of false-belief, giving insight into ToM acquisition in normal development. It supports the evidence base that there could be a relationship between language and ToM. The study looking at this relationship with individuals with ASD found training in language abilities did not lead to an improved ToM. However, there were significant methodological flaws as two of the children did not complete the training. The clinical implications for ASD are disappointing and further research is needed to generate any possibility of an evidence base for clinical practice.

3.3. Teaching Theory of Mind (ToM) to Improve Communication Skills

As discussed earlier, evidence suggests there is a relationship between ToM and language (Milligan, et al., 2007). de Villiers (2000) argues that communication skills such as being able to understand and monitor the listener are crucial for appropriate conversation. Studies such as Apperly and Robinson (1998) have found that young typically developing children do not initially pay attention to the beliefs of others and therefore can misinterpret the truth value in sentences where unnecessary substitutions have occurred.

3.3.1 Autistic Spectrum Disorder (ASD)

It has been argued that one of the primary difficulties for individuals with ASD is pragmatic language abilities (cited Tager-Flusberg, 2000). Pragmatic difficulties and ToM impairments in ASD have been accepted as being linked by researchers in this field (cited, Tager-Flusberg, 2000). Therefore, research has explored the efficacy of training ToM abilities and exploring any subsequent impact on communication skills.

Hadwin, Baron-Cohen, Howlin and Hill (1997) explored whether teaching ToM to children with ASD would have an effect on their ability to develop conversation. Thirty children with ASD were randomly assigned to one of three teaching groups; emotion, belief or pretence. The main findings were that through teaching, the children were able to pass tasks measuring emotion and belief understanding. However, there was no improvement in developing conversation and use of mental state terms. Several explanations are given to

explain the results. Firstly that understanding mental states and conversation skills is not related in normal development. Secondly, that a conceptual change occurred but the children were unable to generalise this. Thirdly, did the children learn to pass the tests without any real understanding of the tasks, thus generalisation to communication skills was not observed. Given the evidence base (discussed above) the latter two explanations seem more plausible.

3.3.2 Schizophrenia

ToM abilities have found to be impaired in individuals with schizophrenia (cited Kayser et al., 2006). Sarfati, Passeriux and Hardy-Bayle (2000) found that individuals with schizophrenia could perform better on a pictorial ToM task when testing involved verbalisation, as well as when explicit information about other individuals' minds was asked. This therefore suggests that deficits in ToM abilities in schizophrenia may be susceptible to training. This has implications for clinical practice as interventions could be designed to teach ToM abilities. As discussed earlier ToM impacts on social functioning and has implications for mental health diagnoses.

Kayser et al. (2006) explored whether teaching ToM abilities would lead to improved communication abilities and have a positive impact on psychopathology in fourteen schizophrenic patients. Participants were randomly allocated to a "video group" or a "control" group. All participants had a ToM task administered pre and post. The video group were shown short scenes from French films showing interactions between people whose mental states needed to be identified and analysed. The therapist guided participants in the analysis. The

therapist did not answer direct questions but made comments and indirect suggestions. The main findings were that participants showed a possible improvement in communication. There were clinical improvements on tasks measuring ToM abilities. The authors point out some limitations with the study. The material had not been used before, there was a small sample size and they did not have a 'complete' evaluation of communication disorder. It is difficult to ascertain which ToM tasks were used and whether they would be deemed close or distant-transfer tasks. This study provides promising results in terms of the relationship between language and ToM in schizophrenia and the possibilities for enhancing ToM abilities through training. However, the impact of the training of everyday abilities is not addressed.

3.3.3 Summary

In summary, Hadwin et al, (1997) found that improved ToM understanding did not lead to improved social communication in children with ASD. This could be due to the participants learning by rote, or due to the well documented difficulties this clinical group have with generalisation (as discussed previously). Kayser, et al. (2006) found that ToM abilities could be enhanced in individuals with schizophrenia and this led to a possible improvement in language abilities. This could contribute to an evidence-base for treating ToM deficits in individuals with schizophrenia in clinical settings.

3.4 Teaching Executive Function (EF) and Theory of Mind (ToM)

Executive functioning (EF) includes skills such as planning, organising, following rules, inhibiting responses and working memory. There has been

growing interest in the relationship between EF and ToM (for an overview see Perner & Lang, 2000). A developmental relationship has been argued due to developmental timelines being similar in typical development. It has also been argued that common brain regions serve both abilities. A further argument is that there is an executive component in ToM tasks (Perner & Lang, 2000). It is important to understand the relationship between EF and ToM as this will have clinical implications for treatment approaches to enhance these skills.

3.4.1. Typically Developing Children

Kloo and Perner (2003) explored the relationship between ToM and EF in sixty typically developing children with a mean age of three years and eight months. The main findings showed a correlation between performance on an EF test and a first-order false-belief task. Kloo and Perner (2003) then examined this relationship further with forty-four typically developing children with a mean age of approximately three years and nine months. There were three training groups; EF, false-belief and a control group. Positive and negative feedback was given as well as explanations. The main findings showed that the EF training and false-belief training led to a significant improvement on the EF task compared with a control group. The EF training led to improved performance on false-belief tasks compared to a control group. The false-belief training did not lead to a significant improvement on false-belief tasks. However, the children generally had good performance at pre-test leaving little room for improvement. This is an obvious limitation of the study and perhaps the inclusion criterion should have been more stringent. The age of participants ranged from three years to four years and seven months. As discussed earlier, previous research has shown that false-belief is

first thought to emerge at three years and nine months (Astington & Gopnik, 1991). Therefore this needs to be taken into consideration when interpreting Kloo and Perner's (2003) findings.

4.4.2 Autistic Spectrum Disorder (ASD)

Fisher and Happe (2005) explored the relationship between EF and ToM in children with ASD. Twenty-seven children with ASD were allocated to the ToM, EF or control group. The children were tested pre and post ToM and EF tasks. Training was to criterion. The ToM training was based on a modified version of thinking about beliefs as "photos in the head" (Sweetenham et al., 1996). The EF training used an analogy of a "brain as a machine" using different "brain tools" for different activities. The main findings showed significant improvements in ToM tests for both training programmes with no improvement for children in the control group. This was maintained at six/twelve week follow up. There was evidence of generalisation to other distant-transfer tests of ToM for the EF training group. Across all three groups, there was no improvement on EF. The EF group had higher scores on EF at pre-test than the other two groups leaving little room for improvement. The authors suggest improvements on ToM in the EF group may be due to the one-to-one sessions with the experimenter rather than content of training. There was no significant generalisation to real life behaviour on a measure completed by teachers. The limitations are reported as small sample size, and that the difficulty level of EF and ToM was not matched.

4.4.3 Summary

To summarise, Kloo and Perner (2003) found that training typically developing children in EF led to improved performance on EF and false-belief, whereas training in ToM led to improvement on EF but not on false-belief task. These findings appear confusing, but the children in the ToM training group generally had good performance at pre-test leaving little room for improvement, therefore reflecting issues with inclusion criteria. This study provides evidence for a relationship between EF and ToM in typically developing children. Fisher and Happe (2005) found that with children with ASD's false-belief performance significantly improved following training in EF or ToM. However, there was no improvement in EF in either groups. The results suggest a relationship between EF and ToM in children with ASD. Overall these studies support that there is some sort of relationship between EF and ToM. They also point towards a clinical need to explore this further, as there are theory-practice implications.

3.5 Metacognitive Rehabilitation

Consciously thinking about thinking forms part of metacognitive skills observed in humans. Metacognitive knowledge involves the cognitive process of knowing about self and others. Metacognitive rehabilitation aims to help the individual have a better understanding of strategies or situations experienced as difficult and teaching is based on mediated learning. The potential of this approach in the enhancement of ToM abilities has therefore been explored.

3.5.1 Schizophrenia

Roncone et al. (2004) explored the use of metacognitive strategies to enhance social cognition including ToM skills. Twenty participants diagnosed with schizophrenia were randomly assigned to either the rehabilitation group or control group. ToM stories with accompanying cartoons were used to measure first and second-order false-belief abilities. The treatment used six of the eight sub-objectives put forward by Feuerstein (1980) in his Individual Enrichment Programme (IEP) designed for individuals with LD. The programme aims to enhance cognitive functions which are present in the individual but not adequately developed. Within sessions, topics were discussed with practical exercises, followed by encouragement to practice in real life settings as homework. Participants were encouraged to provide positive reinforcement and constructive feedback to each other during exercises. The individuals in the control group were treated with antipsychotic medication and supportive psychotherapy as necessary. Findings showed that the trained group showed significant improvements in first and second-order ToM abilities. Successes in real life situations for participants such as embarking in paid or voluntary work and establishing new relationships are discussed.

It may have been useful for Roncone et al. (2004) to use a measure such as the Faux Pas Recognition Test (Stone, Baron-Cohen & Knight 1998) which assesses high level mental state attribution and has an adult version compared to other ToM tasks which have been primarily designed for children or have a child-like feel to them. The group ran for six months and had five therapists for ten patients. The therapists included one psychologist and two psychiatrists. This

would be extremely costly within a NHS setting. This study is a positive step towards the rehabilitation of ToM abilities in schizophrenia. It may have been useful to have a measurable way of evaluating generalisation to everyday life. More research is undoubtedly needed to provide an evidence base for clinical practice.

4. Discussion

4.1 Client Group

4.1.1 Typically Developing Children

Training in false-belief was generally found to lead to improved performance on close-transfer false-belief tasks (Appleton & Reddy 1996; Knoll & Charman, 2000; McGregor et al., 1998; Melot & Angeard, 2003; Slaughter & Gopnik, 1996; Swettenham, 1996). Five of the seven articles found their participants could successfully generalise training to distant-transfer tasks (Appleton & Reddy, 1996; McGregor et al., 1998; Melot & Angeard, 2003; Slaughter & Gopnik, 1996; Swettenham, 1996). It is difficult to ascertain whether these studies demonstrate a conceptual change, or that the children already had some understanding or cognitive structures which were able to be enhanced. Arguing that conceptual change has occurred, is perhaps too presumptuous, as the studies do not provide much evidence for how a ToM is acquired in typical development.

The studies in this review suggest ToM has an association with language (Hale & Tager-Flusberg, 2003, Lohmann & Tomasello, 2003) and EF (Kloo & Perner, 2003) in normally developing pre-school children.

4.1.2 Autistic Spectrum Disorder (ASD) and Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS).

The articles reviewed demonstrated that individuals with ASD can be taught to pass first-order false-belief tasks. However, generalising these skills to distant-transfer tasks or in social interactions proved difficult. These findings are consistent with a wealth of literature suggesting the individuals with ASD have difficulty generalising new skills and knowledge to other settings (Brian, Tipper & Bryson, 2003). It has also been argued that individuals with ASD have general difficulties with theoretical thinking and that their techniques used to understand the physical world, may be very different to typically developing children (Gopnik, Capps, Meltzoff, 2000). Gopnik et al. (2000) discuss how children with ASD have specific physical or causal knowledge without always knowing or caring about the in-depth explanations. An understanding of another mind requires in-depth or abstract thinking.

Another concept is that of a central coherence deficit (Frith, 1989), suggesting individuals with ASD have difficulties with theory formation. These proposed understandings of ASD would support why the studies reviewed only found task specific improvements rather than a generalised or a conceptual change.

Training in language abilities did not lead to an improved ToM in ASD. Training individuals in ToM did not lead to improved social communication. This may suggest that the link between language and ToM is not as straightforward as that found in typical developing children. However, the articles examining this had several methodological flaws and therefore the findings should be treated with caution.

Fisher and Happe (2005) found that children with ASD had a significant improvement in false-belief performance following training in EF or ToM, suggesting a relationship between EF and ToM in children with ASD. These findings have theoretical relevance in that they suggest associations between ToM and EF. However the specificity of this relationship cannot be understood from these results.

Research (Baroni-Cohen, 1991) has suggested that ToM impairments in ASD are due to a both organic and developmental delay perhaps explaining why training programmes have found little success with this population

4.1.3 Social Anxiety and Aggression

Steernemann et al. (1996) found significant improvement on ToM tasks and social skills in real life situations with children with social anxiety and aggression. It is not known if conceptual understanding occurred as distant-transfer tasks were not used. More research into this area would help to provide an evidence base for clinical practice.

4.1.4. Learning Disabilities (LD)

Ashcroft et al. (1999) found that individuals with LD are able to be trained to pass close-transfer false-belief tasks. They argue participants successfully passed a distant-transfer task. However, this task was not administered at pre-test and was not a 'true' distant-transfer task.

4.1.5. Schizophrenia

Kayser et al (2006) found that ToM abilities could be enhanced in individuals with schizophrenia leading to a possible improvement in language abilities. Roncone, et al (2004) found that a metacognitive rehabilitation group treatment led to improved scores in first and second-order ToM stories. However, the studies do not properly assess generalisation to distant-transfer tasks or to real life situations.

4.2 Limitations

Whilst providing valuable data, the findings of all of the studies in this review need to be treated with caution due to the following limitations.

4.2.1 Demographic Information

Research has found that socioeconomic background has an effect on ToM performance, with a lower socioeconomic status leading to poorer performance on ToM tasks (Cutting & Dunn, 1999). Shatz, Diesendruck, Martnez-Beck and Akar (2003) found that social linguistically enriched environments contributes to the relationships found between socioeconomic background and performance on false-belief tasks. There was a noticeable lack of demographic information in the

articles reviewed. Fourteen studies did not report socioeconomic status of participants. Two studies reported participants from diverse social-economic backgrounds (Hale & Tager-Flusberg, 2003; Lohmann & Tomasello, 2003), with two studies reporting that participants had upper-middle or middle class backgrounds (Kloo & Perner, 2003; Slaughter & Gopnik, 1996).

There was also a lack of reporting the racial or ethnic background of participants. Fourteen studies did not provide this. Two studies reported participants were mostly or exclusively Caucasian (Kloo & Perner, 2003; Slaughter & Gopnik, 1996). Two studies reported having a racially diverse or mixed ethnicity sample (Hale & Tager-Flusberg, 2003; Knoll & Charman, 2000). Cultural effects on ToM are not yet fully understood although there is research to suggest that brain areas are employed in a culture specific way during ToM tasks (Kobayashi, Glover & Temple, 2006).

4.2.2 Gender

Research has found that frequency of emotion talk at an early age, is gender specific, with families engaging in these conversations more often with girls than boys (Haden, Haine & Fivush, 1997). The content of these talks are also gender specific, with parents talking more to girls about the causes and consequences of emotions (Fivush, 1992). As would be expected given these experiences, girls communicate more about emotions between the ages of two and six years of age, than boys do (Dunn, Bretherton & Munn, 1987). Early conversations about emotions predict later mental state understanding (Bartsch & Wellman, 1995). Therefore it could be expected that girls should perform better than boys on ToM

tasks. In the studies reviewed, gender of participants was not always specified and there was not any consideration given in any of the studies to how gender differences could impact on the findings.

4.2.3 Family Dynamics

The higher the frequency of mother and baby early interactions (Fonagy, Redfern, & Charman, 1997), a larger family size (Perner, Ruffman & Leekam, 1994) and better quality of sibling relationships (Hughes & Ensor, 2005) have a positive effect on performance on ToM. This information was not considered in the studies reviewed.

4.2.4 Inclusion/Exclusion Criteria

Inclusion and exclusion criteria varied amongst the studies. A stringent inclusion and exclusion criteria is imperative and will have huge implications for the empirical findings and generalisation.

4.2.5 Sample Size

Many of the studies had small sample sizes which may explain why significance was not always achieved. The smaller sample sizes may also result in them not being reflective of the population they represent.

4.2.6 Control Groups

Four of the studies did not include a control group (Ashcroft, Jervis & Roberts, 1999; Chin & Bernard-Opitiz, 2000; Gevers et al, 2006; Lohmann & Tomasello, 2003). Control groups can help determine whether improvements found are due

to a treatment effect. Most studies in this review matched participants in the training and control groups. Matching participants controls for confounding variables (e.g. age) restricts potential biases in the control group. A further consideration is the type of control group used. Giving treatment to individuals in a control group helps establish whether change is associated with the treatment, rather than just receiving treatment. Within this review some studies trained individuals in their control group (Hale & Tager-Flusberg, 2003; Hadwin et al., 1997; Kayser, et al., 2006; Kloo & Perner, 2003; Knoll & Charman, 2000; Slaughter & Gopnik, 1996; Sweetenham, 1996), whereas others received no training (Appleton & Reddy, 1996; Fisher & Happe, 2005; Lohmann & Tomasello, 2003; McGregor, et al., 1996; Melot & Angeard, 2003; Oznoff & Miller, 1995; Roncone et al., 2004; Steernemann et al., 1996). This is an important consideration when exploring the efficacy of treatments in this review.

4.2.7 Assignment

Nine studies randomly assigned their participants to either different training groups or control groups (Fisher & Happe, 2005; Hadwin, et al, 1997; Hale & Tager-Flusberg, 2003; Kayser et al 2006; Kloo & Perner, 2003, Lohmann & Tomasello, 2003; Roncone et al 2004; Slaughter & Gopnik, 1996). Three studies did not randomly allocate for various reasons including practical constraints (McGregor et al., 1998; Oznoff & Miller, 1995; Savina & Beninger, 2007). For the remaining studies, assignment was either not specified (Knoll & Charman, 2000; Melot & Angeard, 2003), or not applicable (Ashcroft et al, 1999; Chin & Bernard-Opitiz, 2000; Gevers et al., 2006; Swettenham, 1996).

4.2.8 Pre-testing

Some of the studies did not assess performance on distant-transfer tasks at pre-test (Appleton & Reddy, 1996; Ashcroft et al., 1999). This means the post-test scores on these measures were meaningless.

4.2.9 False Belief Tasks

In this review false-belief tasks dominated the close-transfer, distant-transfer tasks and training procedures. Baron-Cohen (1991) argues that false-belief understanding may be on a developmental continuum. This may explain why typically developing children generalised false-belief knowledge and children with ASD cannot. Empathy, joint attention and imitation (all early indicators of ToM) were found to be impaired in 20 month old children with autism but not in typically developing children of the same age (Charman, Swettenham, Baron-Cohen, Cox & Baird, 1997). Therefore, it may be beneficial for training studies to focus on these earlier skills, although this presents a new challenge.

4.2.10 Follow up

Only four studies reported follow-up data at 8 weeks (Fisher & Happe, 2005), 11 weeks (Ashcroft et al., 1999) and 12 weeks (Steernemann et al., 1996; Swettenham, 1996). Therefore in other studies, it is not known if the gains made through training are maintained.

4.2.11 Generalisation

Only six studies used distant-transfer ToM tasks following training (Hale & Tager-Flusberg, 2003; Knoll & Charman, 2000; Lohmann & Tomasello, 2003

McGregor et al., 1998; Slaughter & Gopnik, 1996; Swettenham, 2000;). Five studies looked at the impact of other cognitive abilities and the impact training had on ToM and vice versa (Fisher & Happe, 2005; Hale & Tager-Flusberg, 2003; Kayser et al 2006; Kloo & Perner, 2003; Melot & Angeard, 2003). Five studies looked at generalisation to real life situations either through parental and or teacher reports (Gevers et al., 2006; Ozonoff & Miller, 1995; Steinemann, et al., 1996), a real-life ToM task (McGregor et al, 1998) or current relationships (Roncone et al, 2004).

4.3 Theoretical and Clinical Implications

The studies reviewed were delivering psychosocial treatments to those individuals with ToM difficulties or typically developing pre-school children. The studies suggested that there was a developmental relationship between language and ToM as well as EF and ToM in typically developing children.

The relationship between language and ToM was not confirmed in ASD. This is not to suggest that the relationship is not there, rather that it needs more exploration. Fisher and Happe's (2005) findings suggest that there was a developmental relationship between EF and ToM in children with ASD. The outcomes of Fisher and Happe's (2005) training have implications for clinical practice as ToM has been argued to be central to many of social communication deficits in ASD.

Overall the studies looking at the effectiveness of ToM psychosocial treatments for individuals with ASD provided disappointing outcomes. The main difficulty

was associated with generalisation either to distant-transfer tasks or real life situations. Individuals with ASD tend to pay excessive attention to irrelevant detail (e.g. stimulus over selectivity) when learning new skills, thus making generalisation difficult (Brian, Tipper & Bryson, 2003). The studies with individuals with ASD were older than the other studies reviewed. This seems to reflect a move away from examining efficacy of training studies with this client group. More recent research is focussed on examining the relationship between ToM different cognitive functions, such as EF and language by comparing task performance (Pelicano, 2007).

The studies looking at the efficacy of a psychosocial treatments to enhance ToM skills in schizophrenia produced positive clinical outcomes but generalisation was not fully addressed. These preliminary findings with this group suggest ToM may be susceptible to training in these individuals and may have a role in clinical practice.

It is important to continue to explore the theoretical underpinnings of ToM and its application to clinical practice. ToM difficulties are seen across a wide range of clinical populations and impact on both social functioning and mental health. ToM based interventions are not necessarily a routine part of clinical practice in the clinical populations where such difficulties are present. It is interesting to note that the studies found were confined to several clinical groups. There were no training studies found for other clinical populations where ToM impairments have been found such as bi-polar disorder (Olley et al, 2005) and neurological populations such as ABI (Bibby & McDonald, 2005).

4.4 Future Research

Due to the numerous limitations and methodological flaws discussed above, more research is needed in this area. The training studies with individuals with schizophrenia provide promising outcomes and point to a clinical need to build an evidence base. However, the question of how this generalises to every day life needs to be addressed. For individuals with ASD, it may be useful to consider the research regarding ToM being on a continuum. More understanding is also needed in the developmental relationships between other cognitive functions and ToM. There is also a need to develop more research in the efficacy of enhancing ToM abilities in other clinical populations presenting with ToM deficits. Further research is needed to provide a sound evidence base for clinical practice.

4.5 Conclusion

This review found that there are many studies demonstrating that ToM abilities can be taught to typically developing pre-school children and within various clinical populations. The issue of generalising these new skills to distant-transfer tasks or to real life situations has not been proven or properly explored within the clinical populations. The results of this review need to be considered in view of the limitations discussed. There is a strong clinical need to continue to explore this area addressing the methodological flaws of past research. Research with other clinical populations where ToM impairments have been documented, could be investigated.

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Chapter 2: Empirical Paper:

Executive Function and Theory of Mind In Adults with Brain Injury

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are used for the purpose of the thesis))**

Abstract

Difficulties in social and emotional functioning are commonly reported in acquired brain injury (ABI). This study explores performance on theory of mind (ToM) tasks in adults with ABI and whether this is related to performance on tests of executive function (EF). Twelve adults with ABI and fifteen neurologically healthy adults were included in this study. Results showed the ABI group performed significantly worse than neurologically healthy adults on specific ToM tasks. A limited relationship was found between ToM tasks and tests of EF. The results are discussed in terms of the clinical implications and need for further research.

1.Introduction

Following an acquired brain injury (ABI) cognitive and behavioural disturbances are commonly reported (Levin, 1995; Prigotona, Fordya, Zeiner, Roueche, 1986). The typical predictors of outcome have been largely based on neuropsychological data examining cognitive strengths and weaknesses. Predictors of social and emotional functioning have been largely ignored (Havet-Thomassin, Allain, Etcharry-Bouyx & Le Call, 2006). Social relationships have been reported to change following ABI (Ponsford, Olver & Curran, 1995). These changes have been argued to be the most distressing for relatives (Brooks, Campsie, Symington, Beattie & McKinlay, 1986) and the most disabling aspect of ABI (Kinsella, Packer & Olver, 1991). The importance of social functioning in ABI is being brought to the fore through research in theory of mind (ToM)

(Havet-Thomassin et al., 2006). ToM is the cognitive capacity in which the individual can represent their own and other people's mental states. ToM has been widely researched with individuals with autistic spectrum disorder (ASD). Research into ToM and ASD has aimed to understand the social communication difficulties this population can present with (Baron-Cohen, Leslie & Frith, 1985; Baron-Cohen, 1989). Links between ToM impairments and social skills have been found (Rowe, Bullock, Polkey & Morris, 2001). ToM has become an influential aspect of social intelligence within developmental psychology and has been explored in clinical and neurological populations (Bibby & McDonald, 2005; Brune, 2005; Kerr, Dunbar & Bentall, 2003; Kipps & Hodges, 1996).

1.1 Theory of Mind (ToM) as a Theoretical Concept

Different theories on ToM have been presented. Not all use the term "ToM", however, in this paper "ToM" will refer to the cognitive capacity to infer the belief of self and others. Examples of others terms used interchangeably include 'mentalizing' (Corcoran, Cahill & Frith, 1997) or 'mindblindness' (Baron-Cohen, 1995).

Simulation theorists propose that ToM is an act of role taking (Langdon & Colheart, 2001). They assert that people do not infer mental states of others, but take on another's perspective, making a prediction about what they would do if they were that person e.g. 'put yourself in someone else's shoes' (Davies & Stone, 1995). In support of this model are the observations of monkeys and humans which demonstrate mirror neurons, activated by hand and mouth movements when they are observed in others (cited, Brune, 2005).

An alternative view is theory-theory (Perner, 1991) which views ToM as a cognitive skill dependent on inferential abilities and theory-formation skills (Gopnik, 2000). The model argues that children develop a 'theory' of their and others' minds. This is viewed as an ongoing process. The model argues that meta-representational skills are not exclusive to ToM (cited Brune, 2005).

There are two main performance-based theories, the first being that ToM is modular (a 'meta-representational' model) (Sperber, 1994). Within this model, it is proposed that ToM is domain specific. This view has been supported by developmental psychologists (Baron-Cohen, 1995). The second is an executive-function based account of ToM which argues that changes in ToM occur due to developments in EF such as inhibition and memory (Russell, 1996).

1.2 Theory of Mind (ToM) Assessment

The false-belief test has become the acid test of ToM abilities (Dennett, 1978). It requires an understanding that someone else can have a belief which is different to one's own belief and that others can act on their false-belief.

Many ToM tests have been developed to assess different levels of false-belief and not all can be mentioned in this brief review. First-order false-belief tasks assess the ability to attribute a belief to someone else. Typically developing children correctly pass first-order tasks as young as three years and nine months (Astington & Gopnik, 1991). Second-order false-belief tasks assess the ability to attribute a false-belief of another (he thinks that she thinks). Children generally

pass these tests around six to seven years (Perner & Wimmer, 1985). Stone, Baron-Cohen and Knight (1998) designed the *Faux Pas* task to assess high level mental state attributions. This involves the representation of two mental states (why someone should not have said something or why it was awkward and how the person involved may feel).

1.3 Theory of Mind (ToM) in Adults with Acquired Brain Injury (ABI)

Research in ToM with individuals with ABI has provided conflicting results, with some studies finding performance is worse than control groups or that individuals with ABI have impairments on tasks of ToM (Bibby & McDonald, 2005; Fine, Lumsden & Blair 2001; Henry, Philips, Crawford, Ietswaart & Summers, 2006; Martin & McDonald, 2005; Milders, Fusch & Crawford, 2003), whereas others have found no impairment in this area (Bach, Happe, Fleminger & Powell 2000; Bach, Happe, Fleminger and David, 2006; Bird, Castelli, Malik, Frith & Hussain, 2004,). Some research has found conflicting results within their brain injury participants and have explained this in relation to onset or type of lesion/damage (Apperly, Samson, Chiavarino & Humphreys, 2004; Shamay-Tsoory, Tomer, Berger, Goldsher & Aharon-Peretz, 2005; Shaw, Lawrence, Radbourne, Bramham, Polkey & David, 2004; Winner, Brownell, Happe, Blum & Pincus, 1998).

1.4 Executive Function (EF)

Executive functioning (EF) skills are higher order cognitive capacities. EF includes skills such as attentional control, planning, organising, response inhibition, being able to follow and switch rules and working memory. EF is

therefore required for goal-directed behaviours. EF is a higher-order ability and can influence more basic capacities such as attention, memory and motor skills. Due to this, EF can be difficult to directly assess.

1.5 The Relationship Between Theory of Mind (ToM) and Executive Function (EF)

The relationship between ToM and EF is a controversial area within the current literature and the nature of the relationship between ToM and EF is still debated. Many different theories have been put forward (for an overview see Perner & Lang, 2000),

1.5.1 Developmental

The development of typical ToM abilities and EF skills is correlated suggesting a developmental relationship. In terms of self control, Perner & Lang (2000) argue that to have self control or executive control, an understanding of mental concepts is needed. Another argument is that an understanding of mental concepts can only be achieved once executive control has developed (Perner & Lang, 2000). These arguments are more theoretically based than empirically based. Therefore, it remains unclear what comes first.

1.5.2 Brain Regions

Researchers have investigated whether there are common brain regions subserving ToM and EF skills. Some studies have found that brain regions serving ToM also serve EF skills, where as studies have suggested a functional independence (Perner & Lang, 2000). Saxe, Schulz and Jiang, 2006 found that

ToM abilities in adults are both domain-general and domain-specific. The results supported the argument that EF is necessary for adult ToM. In summary the imaging studies can provide associations with tasks, but do not describe essential relationships (Saxe & Baron-Cohen, 1996).

1.5.3 Assessment Procedures

It has been argued that false-belief tasks place demands on working memory (Gordon & Olson, 1998) and response inhibition (Russell, Mauthner, Sharpe and Tidswell, 1991). Therefore the executive components found on ToM tasks, have been part of the explanation as to why a relationship has been found between performance on ToM tasks and tests of EF.

1.6 Theory of Mind (ToM) and Executive Functioning (EF) In Typically Developing Children

The relationship between ToM and EF has been explored in typically developing children. Findings suggest inhibition and working memory is key to the relationship between EF and ToM (Carlson, Moses and Breton, 2002). Several other studies have found that executive control has an indirect effect or is essential for the development of a ToM (Hughes, 1998; Flynn, O'Malley & Wood, 2004).

1.7 Theory of Mind (ToM) and Executive Function (EF) in Other Populations

The relationship between ToM and EF has been explored in many other clinical populations. For example, associations were found between ToM impairments and working memory impairments in individuals with alcohol misuse

(Uekermann, Channon, Winkel, Schlebusch & Daum, 2006). Performance on ToM tasks was found to be correlated with scores on a test of EF in individuals with bipolar disorder (Olley, Malhi, Bachelor, Cahill, Mitchell & Berk, 2005).

1.8 Theory of Mind (ToM) and Executive Function (EF) in Acquired Brain Injury (ABI).

Research has explored the relationship between ToM and EF in ABI. Conflicting results have been found. Case studies have concluded that ToM and EF are independent of one another or dissociated (Bach, et al., 2000; Fine et al., 2001, Bird et al., 2004). However these case studies cannot be generalised, but are useful as indicators for further research.

Group studies provide conflicting results finding either no relationship (Havet-Thomassin et al., 2006) or a limited relationship between performance on ToM and EF tests (Bach, et al., 2006, Henry et al., 2006). In other studies, relationships have been found but have been specific to brain injury site (Rowe et al., 2001; Apperly et al., 2004).

In the studies exploring the relationship between EF and ToM there are methodological flaws. Many studies do not use control groups to ascertain what is being found is specific to ABI. Some studies do not use a standardised measure of EF with psychometric properties (Apperley et al., 2004) or only use one measure of EF (Henry et al., 2006). EF covers many high-order abilities that can not always be captured by one measure of EF.

To summarise, the studies have methodological flaws and there does not appear to be conclusive evidence regarding the presence or nature of the relationship of ToM and EF in ABI

1.9 Aims and Rationale for the Present Study

This study is investigating the relationship between ToM and EF in ABI. It is important to explore this relationship to aid understanding of social and emotional difficulties commonly seen following ABI. The understanding of this relationship has implications for rehabilitation. Effective rehabilitation should make theory-practice links, providing evidence-based practice.

Using a group of ABI participants is reasonable as research is commonly conducted in this way (Bibby & McDonald, 2005). Rehabilitation services are set up for individuals with ABI and are not associated with localisation of brain injury. This is due to commonalities found within ABI populations (e.g. memory difficulties).

The limited and contradictory empirical findings mean that the proposed study is essentially exploratory. Therefore the following hypotheses are preliminary.

1.9.1 Hypothesis 1: Performance on tests of ToM will be significantly poorer for the ABI group than the neurologically health group.

The previous research provides conflicting results as to whether individuals with brain injury have an impaired ToM. In the current study, four ToM tasks will be used. The Smarties task (Perner, Leekham & Wimmer 1987) which is a first-

order ToM task will be used. The Ice-Cream Van Task (Perner & Wimmer, 1985) which is a second-order ToM task will be used. An adapted version of the video-based false-belief task (Apperly et al., 2004) which is a second-order ToM task with reduced language and executive demands will be used. The Faux Pas Recognition Test (Stone, Baron-Cohen and Knight, 1998) is a higher-order ToM task and shall be used as the final measure of ToM.

1.9.2. Hypothesis 2: There will be a significant relationship between the performance on tests of ToM and EF for the ABI group and the neurologically healthy group

The relationship between ToM and EF in individuals with ABI has not been explored in great depth and has provided contrasting evidence. The conflicting results may be due to some of the tests used in previous studies and their abstraction from everyday life. It has been reported that performance on tests does not always match real life difficulties (Shallice & Burgess, 1991) and this is often experienced in clinical practice. Shallice and Burgess (1991) reported that the performance of three neurological patients on two tests of EF; the Multiple Errands Test (MET) and the Modified Six Elements (This is a subtest in the Behavioural Assessment of the Dysexecutive Syndrome (BADS) (Wilson, Alderman, Burgess, Emslie & Evans, 1996)), was consistent with everyday abilities. Following this, the simplified version of Multiple Errands Test (MET-SV) (Alderman, Burgess, Knight & Henman, 2003) was developed. It was found that some of the individuals with ABI who had passed traditional tests of EF, failed the MET-SV. To date, no study found has used the MET-SV as part of their tests of EF when looking at its relationship to ToM in ABI participants.

This study proposes to take an ecological approach to examining the EF of participants. Two standardised measures of EF will be used. The first is the MET-SV (Alderman et al., 2003) (administered in a shopping centre). By using this ecological measure of EF, it will allow some of the testing to come outside of the office. Current literature stresses the importance of testing in more ecologically valid environments (Manchester, Priestley and Jackson, 2004). The BADS will also be used. The DEX questionnaire (forms part of the BADS) will be used as a measure of symptoms of EF.

1.11 Clinical Implications

It is hoped that this study will contribute to the understanding of ToM abilities and the relationship between ToM and EF in individuals with ABI.

Rehabilitation with individuals with ABI is heavily concentrated on cognitive, behavioural and physical/functional abilities, with social and emotional functioning taking a back seat. Within rehabilitation programmes, there is a lack of emphasis on social skills. Behaviour difficulties are commonly reported in ABI (Johnson & Balleny, 1996) accompanied by inappropriate social behaviour and impaired social communication (Milders et al., 2003). This area of functioning needs to be investigated further. Researchers have started exploring ToM abilities in brain injury groups to further aid understanding of reported difficulties in emotional and social functioning.

ToM assessment is not routinely being carried out in rehabilitation programmes with individuals with ABI. If ToM deficits are found to be common in individuals with ABI, it may be important to incorporate this into the wider assessment of rehabilitation needs. There is a wealth of research that has explored the effects of ToM deficits and the subsequent consequences in social relationships. A ToM impairment can lead to a withdrawal in social contact (Happe, 2001), difficulties understanding non literal speech (Channon & Crawford, 2000), inappropriate non verbal communication, an inability to follow social rules (Bowler, 1992) and an indifference to social cues and the opinions of others (Rowe et al., 2001). It is hoped that this research could provide evidence based practice for the rehabilitation of social deficits in those individuals with ABI.

Method

2.1 Design

To explore the relationship between ToM and EF in adults with ABI. Performance on ToM tasks and EF tests were compared and contrasted with neurologically healthy controls. Participants were not matched on age and gender due to difficulties with recruitment. However the spread of age and gender across groups was analysed to assess for any possible confounding variables¹.

¹ See results section (page 57) for this analysis.

2.2 Participants

2.2.1 Acquired Brain Injury (ABI)

Inclusion criteria for this group were an ABI, a demonstrated capacity to consent and that the MET-SV, the BADS, the DEX questionnaire and the Wechsler-Adult Intelligence Scale—third Edition (WAIS-III) had already been administered as part of routine assessment and rehabilitation. The scores for these tests were taken from participants' clinical notes. For the majority of participants the neuropsychological assessment data was less than one year old. For the participants whose data was over a year old, their brain injury occurred many years ago (between 6 and 18.5 years) and therefore subsequently some had more than one neuropsychological assessment. Their neuropsychological data was compared over time and it was found that no major changes in their cognitive profile had occurred. The most recent assessment data was used. Therefore, the retrospective neuropsychological data is likely to be a true reflection of the cognitive profiles for all of the participants. It is common for studies with brain injured participants to use retrospective neuropsychological data (Bibby & McDonald, 2005).

For the ABI group, fourteen out of eighty-four patients residing at an inpatient neurobehavioural brain injury unit were identified as matching the inclusion criteria. Twelve ABI adults consented to taking part. Age (mean =32.25) and gender (nine male, three female) was recorded. Information such as Glasgow Coma Scale (GCS) (3-8 = severe, 9-12 = moderate) and type of brain injury was

taken from clinical notes (this information was not always available). (see table 1) For the GCS, scores for only two participants were found and therefore this is why this information is not included in the table. Cause of injury was also recorded (assault = 3, road traffic accident = 3, overdose = 2, fall = 3 and penetrating injury = 1).

Table 1: Clinical details of ABI participants

Time Post-Injury (years)	Injury Site/Type of Brain Injury
6.5	(Information not available)
4.5	Right temporal
18.5	Diffuse
2	Hypoxic Brain In jury
6	(Information not available)
2.5	Left frontal temporal
13	Left frontal lobe and left temporal lobe
20	Bi frontal, and left anterior temporal damage
1.5	Haematoma
7	Mild swelling, no focal pathology
17.5	(Information not available)
10.5	Hypoxic Brain Injury

RTA = Road Traffic Accident

2.2.2 Neurologically Healthy

For the neurologically healthy controls, an email was sent to approximately 300 staff members at the neurobehavioural brain injury unit. Twenty-five staff

members requested further information, resulting in fifteen staff consenting to take part. Age (mean = 34.6) and gender (seven male, eight female) was recorded (see table 2). Exclusion criteria were a brain injury or a diagnosis of autism.

Table 2:Neurologically Healthy Controls

Participant	Current	Gender
No	Age	
1	24	Male
2	22	Female
3	38	Female
4	46	Female
5	48	Female
6	42	Male
7	30	Male
8	30	Male
9	25	Female
10	50	Female
11	21	Female
12	20	Male
13	45	Male
14	41	Female
15	37	Male

2.3 Measures

2.3.1 Theory of Mind

2.3.1.1 The Smarties Task (Perner et al., 1987)

The Smarties Task is a well recognised and widely used test of first-order ToM abilities. It has been extensively used in the research with children with ASD. However it was felt to be more adult appropriate than other established first-

order tests of ToM which use child friendly stories or dolls (e.g. Sally-Anne Task). Participants were asked what they thought was in the Smarties tube, they were then shown that there were pens in the tube rather than the expected sweets. They were asked what they thought was in the tube again. They were then asked what they thought was in the tube before (belief-self question). They were then asked, if someone else came in the room what would they guess in the tube (belief-other question). Scores were either 0 or 1. All participants had this task administered. Testing time took approximately one minute.

2.3.1.2 The Ice-Cream Van test (Perner & Wimmer, 1985)

The Ice-Cream Van task is a well recognised and widely used second-order ToM test. The adapted story by Bibby and MacDonald (2005) for a brain injury population was used. The story involves John and Mary at the park wanting to buy an ice-cream. Mary has no money, so the ice-cream man tells her he will be in the park all day. Mary leaves to go home and get money. The ice-cream man then decides to go to the church and tells John this. On his way to the church he sees Mary and tells her where he is going. Later on John goes to Mary's house and her sister tells him she has gone to buy an ice-cream. John then goes to look for Mary in the park. The scoring system was also adapted by Bibby and MacDonald (2005) for a brain injury population to reduce language demands. The scoring involves an implicit (Why does John look for Mary in the park?) and explicit question (What was John thinking when he looked for Mary in the park?) followed by two forced questions (Does John think Mary will be in the park?, Does John know that Mary knows where the ice-cream van is?). Answers for the implicit question are scored from 0-2, for the remaining questions, scores are

either 0 or 1. Traditionally this test would be presented with dolls and a model village, however this was not felt appropriate for the adult participants. As in the Bibby and MacDonald (2005) study, the participants were given a written copy of the story to reduce demands on memory (see Appendix D). All participants had this task administered. Testing time took approximately three minutes.

2.3.1.3 The Adapted Video-Based False-Belief Task (Qureshi, 2004)

This task was adapted from a false-belief task devised by Apperly et al. (2004) (See Appendix E). It is a second-order ToM test. It is claimed to expel some of the difficulties found in other ToM tasks. It can be administered without language and eliminates inhibitory and working memory demands. In the sequence of video-stills on a computer, the man hides or has hidden a green object in either the box on the left or the right, the woman leaves the room and the man may or may not change the boxes from left to right or vice versa. The woman uses a pink triangular marker to help the participant, by showing where she thinks the green object is hidden. The participant has to infer whether she has a false or true belief when they have to decide the actual location of the green object (i.e. in the left or right box). This task is claimed to allow for testing of more severely impaired participants. In this study the false-belief trial scores are reported and a score between 0-16 could be achieved. All participants had this task administered. Testing time took approximately twenty minutes.

2.3.1.4 Faux Pas Recognition Test (Adult Version) (Stone et al., 1998)

The faux pas recognition test assesses high level mental state attributions (or high level ToM). This test has ten faux pas and ten control stories. Participants are

read a short story and have a copy of it to reduce memory and language demands. At the end of the story the faux pas question is asked i.e. whether someone said something they should not have said or something awkward. If they answer yes there are five other faux pas questions including, why it was a faux pas and how the character affected may feel. There are also control questions to ensure the participant has understood the story. Separate scores are given on the faux pas stories for the faux pas questions (referred to in this study as faux pas-faux pas) and control questions. Separate scores are also given for the control stories for the faux pas questions and control questions. Percent scores are then calculated. The faux pas-faux pas scores are used in this study (for an example of a story from the Faux Pas Recognition Test, see Appendix F). All participants had this task administered. Testing time took approximately 20 minutes.

2.3.2 Executive Function (EF)

2.3.2.1 The Multiple Errands Test – Simplified Version (MET-SV) (Alderman, et al., 2003)

The MET-SV is an ecological measure of EF. It has face validity as the individual carries out a shopping task similar to an everyday activity. The participant is expected to carry out 3 tasks (to buy six items, obtain four pieces of information and meet under the clock after 20 minutes) whilst obeying specific rules (i.e. cannot spend more than £6.50, can only enter a shop to buy an item, etc) (see Appendix G). It has normative data on a neurological group ($n = 50$) and a healthy control group ($n = 46$) and it was found to discriminate well between both groups. Many of the participants in the neurological group passed more traditional tests of EF, but failed the MET-SV. This was in accordance with

observed executive difficulties in every day life. Scores for the ABI group were taken from clinical notes. This test was therefore only administered to neurologically healthy controls. Testing time was between approximately twenty and forty minutes.

2.3.2.2. The Behavioural Assessment of the Dysexecutive Syndrome (BADS) (Wilson et al., 1996)

The BADS measures various areas of dysexecutive syndrome (DES). It assesses skills such as problem solving, planning and organising and attention (see Appendix H). In terms of ecological validity, this test is sensitive to the everyday problems experienced by individuals with brain injury. It has normative data on 308 UK participants (92 patients, 216 controls). The Dysexecutive Questionnaire (DEX) (See Appendix I) also forms part of the BADS. It is a 20-item questionnaire covering four areas: emotional or personality, motivational, behavioural and cognitive. There is a self (DEX-S) and other (DEX-O) rating. Scores for the ABI group for the BADS and DEX were taken from clinical notes. Two subtests from the BADS were used for the neurologically healthy group; Zoo Map and Modified Six Elements. These two subtests account for the most variance in the test (Wilson, Alderman, Burgess, Emslie & Evans, 1996). The DEX-S was also administered to the neurologically healthy group. Testing time was approximately twenty minutes.

2.3.3. Intellectual Functioning

2.3.3.1 Wechsler Adult Intelligence Scales – Third Edition (WAIS-III) (Wechsler, 1997)

The WAIS-III is a standardised measure of intellectual functioning. It provides a performance IQ (PIQ), verbal IQ (VIQ) and full scale IQ (FSIQ) as well as other index scores. It has excellent psychometric properties and the norms allow for testing of participants ranging from sixteen to eighty nine years of age (Wechsler, 1997). Scores for the ABI group were taken from the clinical notes.

2.3.3.1 Wechsler Test of Adult Reading (WTAR) (Wechsler, 2001)

The WTAR is measure to predict a person's pre-injury or premorbid intellectual functioning. The WTAR allows for WTAR predicted WAIS-III PIQ, VIQ, FSIQ scores (See Appendix J). It has excellent psychometric properties (Wechsler, 1997). The neurologically healthy group had this test administered to them. Testing time was approximately five minutes.

2.4 Procedure

Ethical approval was gained (see Appendix M). All participants expressing interest in the research were sent a letter of invitation (see Appendix K), an information sheet (see Appendix K), and a consent form (see Appendix K). For the ABI participants a letter was sent to their Responsible Medical Officer (RMO) if they consented to take part. All participants were aware of their right to withdraw, as well as confidentiality and anonymity. All participants were given a debrief sheet (See Appendix K) and the opportunity to have debrief time with the

researcher if needed. All participants were given the choice of having feedback on their scores on the tasks/tests administered.

2.4.1 ABI - Procedure

The ABI group had already had the MET-SV, BADS, DEX and WAIS-III measures administered as part of routine assessment and rehabilitation. The ToM tests were administered in the following order: Smarties Task, Ice-Cream Van Task, Adapted Video-Based False-Belief Task and Faux Pas Recognition Test over either two or three sessions. During the Adapted Video-Based False-belief Task, participants were encouraged to take a break between the different blocks. Total testing time was approximately fifty minutes.

2.4.2 Neurologically Healthy - Procedure

For the neurologically healthy group, the MET-SV was completed in the first session. The remaining tasks/tests were completed in the following order over one, two or three sessions. DEX-S, BADS (Zoo Map and Modified Six Elements only), WTAR, Smarties Task, Ice-Cream Van Task, Adapted Video-Based False-belief Task and Faux Pas Recognition Test. During the Adapted Video-Based False-belief Task, participants were encouraged to take a break between the different blocks. Total testing time for this group was approximately two hours.

3. Results

3.1 Preliminary Analysis

(Only significant findings are presented in this section, for all other findings see results tables in Appendix L).

The data was explored by visual inspection using box plots. Several outliers were identified. To assess the impact of the outliers on the analysis, a comparison was made between the mean value and the 5% trimmed mean. Subsequently no cases were excluded.

3.2 Possible Confounding Variables

3.2.1 Intelligence, ToM and EF

To explore the relationships between intelligence and ToM and intelligence and EF in the ABI group, a Pearson's product-moment correlation was going to be used. However, on examination of the WAIS-III scores, it was found that for six participants there were large discrepancies on subtests scores. This meaning that the overall scores were not a true reflection of their intellectual functioning. Therefore it was decided that the effect of intelligence could be truly be explored within the ABI group.

To explore the relationship between intelligence and ToM and intelligence and EF in the neurologically healthy group Pearson's product-moment correlations were used. The relationship between WTAR predicted WAIS-III FSIQ, VIQ and PIQ scores and ToM tasks were explored. The relationship between WTAR

predicted WAIS-III FSIQ, VIQ and PIQ scores and EF tasks were explored. No significant correlations were found and therefore it was decided that partial correlations would not be used.

3.2.2 Age

An independent t-test found no significant differences between the mean ages of the ABI group and the neurologically healthy group. Therefore partial correlations to control for age were not used in the analysis.

3.2.3 Gender

In the neurologically healthy sample, there were eight females and seven males.

A chi-square test of equiprobability revealed this did not deviate significantly from expected counts: $\chi^2 (1) = 0.07$ $p = .796$. In the ABI sample, there were three females and nine males. A chi-square test of equiprobability revealed this did not deviate significantly from expected counts: $\chi^2 (1) = 3.00$, $p = .083$.

There were eight females in the neurologically healthy group and three in the ABI group. A chi-square test of equiprobability revealed this did not deviate significantly from expected counts: $\chi^2 (1) = 2.27$, $p = .132$. There were seven males in the neurologically healthy group and nine in the ABI group. A chi-square test of equiprobability revealed this did not deviate significantly from expected counts: $\chi^2 (1) = 0.25$ $p = .617$

A chi-squared contingency test was computed. Again, observed counts did not deviate significantly from expected counts $\chi^2 (1) = 0.14$ $p = .239$.

3.3 Data Analysis

(Significant findings, or findings with medium or large effect sizes are presented, for all other findings see results tables in Appendix K). Due to directional hypotheses, a one-tailed analysis would be expected. However, due to the small sample size and amount of data, two-tailed tests have been used allowing for a more conservative analysis of the data and to guard against type I errors.

3.3.1 Hypothesis 1: Performance on tests of ToM will be significantly poorer for the ABI group than the neurologically health group.

3.3.1.1 First-Order ToM Task

For the Smarties tests, no significant differences were found, as all participants passed this task (see table 3).

3.3.1.2 Second-order ToM Tasks

For the Ice-Cream Van test, no significant differences were found (see table 3).

On the false-belief trials for the adapted video-based false-belief task, the neurologically healthy group ($M = 9.66$, $SD = 5.75$) performed significantly

better than the ABI group ($M = 5.41, SD = 1.88$) $t(17.59) = 2.68, p = .003$ (two-tailed) (see table 3).

3.3.1.3 Higher-Order ToM Task

For the faux pas-faux pas questions the neurologically healthy group ($M = 85.53, SD = 11.95$) performed significantly better than the acquired brain injury group ($M = 65.91, SD = 18.21$) $t(18.95) = 2.84, p = .006$ (two-tailed) (see table 3).

Table 3: Performance on ToM Tasks for the ABI and Neurologically Healthy Group

	Neurologically	Acquired	Neurologically	Acquired	p
ToM Task	Healthy	Brain	Healthy Mean	Brain	(two
	N	Injury		Injury	tailed)
		N		Mean	
<hr/>					
<u>Ice-Cream Van</u>					
Total Score	15	12	5.53	2.66	.076
<u>Adapted Video-Based False-</u>					
<u>belief Task</u>					
False-belief Trial	15	12	9.66	5.41	.003*
<u>Faux Pas</u>					
Faux Pas-Faux Pas	15	12	85.53	65.91	.006*

* significance at .05 level (two tailed)

3.3.1.4 Summary

Out of the four ToM tasks, the neurologically healthy group performed significantly better than the ABI group on two ToM tasks, thus showing support for hypothesis 1.

3.3.2 Hypothesis 2: There will be a significant relationship between the performance on tests of ToM and EF for the ABI group and the neurologically healthy group

3.3.2.1 First-Order ToM Task

There were no correlations found between performance on the Smarties task and tests of EF for both groups. This perhaps is due to all participants passing this task.

3.3.2.2 Second-Order ToM Tasks

For the ABI group the relationship between the Ice-Cream Van test and tests of EF was investigated using Pearson's product-moment correlation co-efficient. No significant correlations were found. Due to the small sample size, medium and large effect sizes were investigated (see table 4) and are impressive given the sample size. The negative correlations with the MET-SV and DEX-Self suggest a positive relationship with the Ice-Cream Van task (higher scores on MET-SV and DEX-Self indicate a worse performance/rating). Interestingly the medium and large effects for the BADS and DEX-Other indicate both positive and negative relationships with the Ice-Cream Van test. With power set at .8, estimated sample sizes were calculated at .05 (two-tailed) (see table 4 below)

The relationship between the total score on the Ice-Cream Van test and tests of EF was explored in the neurologically healthy group. One significant positive correlation was found with the BADS Zoo Map subtest $r = .712$ $n = 15$, $p = .003$.

A positive medium effect size for MET-SV suggests a negative relationship (a

higher score on MET-SV indicates a worse performance). With power set at .8, estimated sample sizes were calculated at .05 (two-tailed) (see table 5 below)

Table 4 – ABI Group – Correlations with medium effect sizes between Ice-Cream Van total score and tests of EF, with power indicating the sample size needed for a significant result.

EF Test	<i>r</i>	<i>N</i>	<i>P</i> (two-tailed)	Effect	Power
<u>MET-SV</u>					
Total Errors	-.476	12	.188	Medium	37
<u>BADS</u>					
Zoo Map	-.485	12	.110	Medium	35
Modified Six Elements	.310	11	.345	Medium	83
<u>DEX</u>					
DEX-Self Total	-.453	12	.139	Medium	39
DEX-Other Total	.490	12	.106	Medium	34
DEX-Other-Inhibition	.490	11	.106	Medium	34

Table 5 – Neurologically Healthy Group – Significant correlations and correlations with medium and large effect sizes between Ice-Cream Van total score and tests of EF, with power indicating the sample size needed for a significant result.

	<i>r</i>	<i>N</i>	<i>P</i>	Effect	Power
EF Test			(two-tailed)		
<u>MET-SV</u>					
Total Errors	.350	15	.200	Medium	65
<u>BADS</u>					
Zoo Map	.712	15	.003**	Large	

** significance at .01 level (two-tailed)

The correlations coefficients between the Ice-Cream Van total score and tests of EF for both groups were compared by converting the *r* score to a *z* score. Significant differences were found (see table 6).

Table 6: Difference between the correlation coefficients for the Ice-Cream Van total score and tests of EF for both groups

	ABI	Neurologically	Difference	<i>p</i>
EF Test	<i>R</i>	Healthy	<i>Z</i>	(two-tailed)
		<i>R</i>		
<u>MET-SV</u>				
Total Errors	-.476	.350	-3.67	.002**
<u>BADS</u>				
Zoo Map	-.485	.712	-2.053	.040*
Modified Six Elements	.310	-.012	.831	.406
<u>DEX</u>				
DEX-Self Total	-.453	.220	-1.738	.082

* significance at .05 level ** significance at .01 level (two-tailed)

For the ABI group, the relationship between the false-belief trial on the adapted video-based false-belief task and scores on tests of EF were investigated using Pearson product-moment correlation coefficient. No significant differences were found. Again, medium and large effect sizes are reported (see table 7). The medium and large effect sizes show that a better performance on the MET-SV, and BADS correlates with a better performance on the false-belief trial. With power set at .8, estimated sample sizes were calculated at .05 (two-tailed) (see table 7 below)

The relationship between the false-belief trial on the video-based false-belief task and scores of tests of EF was explored in the neurologically healthy group using Pearson product-moment correlation coefficient. No significant differences was found. Medium and large effect sizes were explored (see table 8). For the medium effects on the BADS a better performance correlates with a better performance on the false-belief trial. With power set at .8, estimated sample sizes were calculated at .05 (two-tailed) (see table 8 below).

Table 7: ABI Group – Correlations with medium and large effect sizes between False-belief Trial on the Adapted Video-Based False-belief Task and tests of EF, with power indicating the sample size needed for a significant result.

	<i>r</i>	<i>N</i>	<i>P</i>	Effect	Power
EF Test			(two-tailed)		
<u>MET-SV</u>					
Total Errors	-.528	12	.078	Large	29
<u>BADS</u>					
Zoo Map	.458	12	.134	Medium	38
Age Corrected	.510	12	.109	Large	31
Standardised Score					

Table 8: Neurologically Healthy Group – Significant correlations and correlation with medium and large effect sizes between False-belief Trial on the Adapted Video-Based False-belief Task and tests of EF, with power indicating the sample size needed for a significant result.

	<i>r</i>	<i>N</i>	<i>P</i>	Effect	Power
EF Test			(two-tailed)		
<u>BADS</u>					
Zoo Map	.490	15	.064	Medium	34
Modified Six Elements	.357	15	.191	Medium	63

The correlations coefficients between the False-belief Trial on the Adapted Video-Based False-belief Task and tests of EF for both groups were contrasted to assess for any significant differences. A significant difference was found for MET-SV Total Errors, suggesting that this explains significantly more of the variance on the false-belief trial for the ABI group. No other significant differences were found (see table 9).

Table 9: Difference between the correlation coefficients between the False-belief Trial on the Adapted Video-Based False-belief and tests of EF for both groups.

	ABI	Neurologically	Difference	<i>p</i>
EF Test	<i>r</i>	Healthy	<i>z</i>	(two-tailed)
		<i>r</i>		
Total Errors	-.528	.258	-2.029	.042*
<u>BADS</u>				
Zoo Map	.458	.490	-.083	.934
Modified Six Elements	.267	.357	-.232	.816
<u>DEX</u>				
DEX-Self Total	.115	-.246	.932	.351

* significance at .05 level (two-tailed)

3.3.2.3 Higher-Order ToM Task

The relationship between the faux pas- faux pas questions and tests of EF was investigated in the ABI group using Pearson product-moment correlation coefficient. There was one significant positive correlation with the BADS Age Corrected Standardised Score, $r = .79$ $n = 12$, $p = .003$. Due to the small sample size, effect sizes were investigated (see table 10). The large effect sizes found for the MET-SV and the medium effect sizes for the BADS show an improved performance correlates with better scores on the faux pas-faux pas questions. A lower rating on the DEX-Other was found to correlate with higher scores on the faux pas questions on the faux pas stories. With power set at .8, estimated sample sizes were calculated at .05 (two-tailed) (see table 10 below)

The relationship between the faux pas- faux pas questions and subtests and tests of EF was investigated in the neurologically healthy group using Pearson product-moment correlation coefficient. No significant correlations were found. Medium and large sizes were investigated (see table 11). Large effect sizes were found for MET-SV and the two BADS subtests, suggesting a positive correlation with faux pas- faux pas questions. With power set at .8, estimated sample sizes were calculated at .05 (two-tailed) (see table 11 below)

Table 10: ABI Group – Significant correlations and correlations with medium and large effect sizes between faux pas-faux pas questions and tests of EF, with power indicating the sample size needed for a significant result.

	<i>R</i>	<i>N</i>	<i>P</i>	Effect	Power
EF Test			(two-tailed)		
<u>MET-SV</u>					
Total Errors	-.543	12	.068	Large	28
<u>BADS</u>					
Modified Six Elements	.510	12	.109	Large	31
Age Corrected Standardised Score	.796	12	.003**	Large	-
<u>DEX</u>					
DEX-Other	-.316	12	.317	Medium	80
DEX-Other-Inhibition	-.313	11	.349	Medium	81
DEX-Other-Intentionality	-.414	11	.205	Medium	47
DEX-Other-Executive	-.303	11	.365	Medium	86
Memory					

** significance at .01 level (two-tailed)

Table 11: Neurologically Healthy Group – Correlations with medium effects between faux pas-faux pas questions and tests of EF, with power indicating the sample size needed for a significant result.

	<i>R</i>	<i>N</i>	<i>P</i>	Effect	Power
EF Test			(two-tailed)		
<u>BADS</u>					
Zoo Map	.309	15	.263	Medium	83
Modified Six Elements	.417	15	.122	Medium	46

The correlations coefficients between the faux pas-faux pas questions and tests of EF for both groups were contrasted to assess for any significant differences. No significant differences were found (see table 12)

Table 12: Difference between the correlation coefficients between the faux pas-faux pas questions and tests of EF for both groups, with power indicating the sample size needed for a significant result.

	ABI	Neurologically	Difference	<i>p</i>
EF Test	<i>r</i>	Healthy <i>R</i>	<i>z</i>	(two-tailed)
<u>MET-SV</u>				
Total Errors	-.543	-.290	.653	.514
<u>BADS</u>				
Zoo Map	.209	.309	-2.58	.796
Modified Six Elements	.510	.417	.240	.810
<u>DEX</u>				
DEX-Self	.272	.037	.607	.544

3.3.2.4 Summary

To summarise the findings a table was created to show the relationships between symptoms of EF (DEX-Other ratings) and ToM tasks for the ABI group (see table 13) and relationships between tests of EF and ToM tasks for both the ABI (see table 14) and neurologically healthy group (see table 15). The direction of some of the correlations have been reversed so a ‘-’ indicates a negative relationship, and a ‘+’ sign indicates a positive relationship. A ‘n/a’ means the correlation either had no or a small effect size.

One significant correlation was found in the ABI group between the faux pas-faux pas questions and the BADS age corrected standardised score. One significant correlation was found in the neurologically healthy controls between the Ice-Cream Van test and the BADS Zoo Map subtests. Other medium and large correlations were found indicating support for hypothesis 2.

Table 13: ABI group - Relationships between symptoms of EF (DEX-Other ratings) and ToM tasks

ToM Task	DEX-Other Total	DEX-Other Intentionality	DEX-Other Inhibition	DEX-Other Executive Memory	DEX-Other Positive Affect	DEX-Other Negative Affect
Ice-Cream Van Task	-	-	n/a	n/a	n/a	n/a
False-belief Trial	n/a	n/a	n/a	n/a	n/a	n/a
Faux Pas-Faux Pas	+	+	+	+	n/a	n/a

Table 14: ABI group – Relationships between tests of EF and ToM tasks

ToM Task	MET-SV Total Score	BADS-Age Corrected Standardised Score	BADS-Zoo Map	BADS-Modified Six Elements
Ice-Cream Van Task	+	n/a	-	+
False-belief Trial	+	+	+	n/a
Faux Pas-Faux Pas	+	***	n/a	+

*** significance at .01 level (two-tailed)

Table 15: Neurologically Healthy group – Relationships between tests of EF and ToM tasks

ToM Task	MET-SV Total Score	BADS-Age Corrected Standardised Score	BADS-Zoo Map	BADS- Modified Six Elements
Ice-Cream Van Task	-	Not applicable	+**	n/a
False-belief Trial	n/a	Not applicable	+	+
Faux Pas-Faux Pas	n/a	Not applicable	+	+

*** significance at .01 level (two-tailed)*

4. Discussion

4.1 Hypothesis 1: The performance on tests of ToM will be significantly poorer for the ABI group than the neurologically health group.

The results showed that the ABI and neurologically healthy group all passed the first-order ToM task. Significant differences were found for one of the second-order tasks (false-belief trial on the Adapted Video-Based False-belief Task) and the higher order ToM task (faux-pas-faux pas on Faux Pas Recognition Test), with the neurologically healthy group performing better. These results are consistent with other research (Bibby & McDonald, 2005; Martin & McDonald, 2005, Henry et al., 2006) and show support for hypothesis 1.

4.2 Hypothesis 2: There will be a significant relationship between the performance on test of ToM and EF for the ABI group and the neurologically healthy group

Positive correlations were found for the ABI group between symptoms of EF as measured by the DEX-Other and the faux pas-faux pas questions. This suggesting a relationship between fewer observed EF difficulties and better performance on this task. Interestingly, the Ice-Cream Van task suggested that as more EF difficulties are reported on the DEX-Other, the better the performance on the Ice-Cream Van task.

Specific positive relationships were found for both groups with the false-belief trial on the Adapted Video-based false-belief task and faux pas-faux pas questions on the Faux Pas Recognition Test and specific tests of EF. This demonstrating that these ToM tasks have a limited relationship with tasks of EF. For the Ice-Cream Van task, there was a mix of positive and negative relationships with the EF tests.

Overall, the results suggest a positive correlation between performance on ToM tasks and tests of EF. This is consistent with recent research that has found a limited relationship between ToM and EF in ABI (Bach et al., 2006; Henry, et al., 2006).

It is not possible in this study to pinpoint specific aspects of EF implicated in ToM abilities. This is due to the lack of significant findings. Therefore to specify

which aspects of EF are related to ToM based on these results, would be over interpreting the findings.

In the ABI group, MET-SV total scores consistently correlated (medium and large effect size) with second-order and higher-order ToM tasks. The Modified Six Elements subtest was found to correlate (medium and large effect size) with one of the second-order and the higher-order ToM task. The age corrected standardised score on the BADS had a significant correlation with the faux pas-faux pas questions and a large effect size when correlated with the false-belief trial.

For the neurologically healthy group, the Zoo Map subtest correlated significantly or had medium effect sizes with the two second-order and higher-order ToM tasks. The Modified Six Element's subtest was found to correlate (medium effect size) with one of the second-order and the higher-order ToM tasks.

To put the above findings in context; the Zoo Map subtest measures planning and error utilisation, the Modified Six Elements also measures planning and the ability to follow rules. The MET-SV requires planning abilities as well as following rules and error utilisation in a real life situation.

It is useful to consider why the Ice-Cream Van task was negatively correlated with some symptoms and tests of EF. The Ice-Cream Van task appears to place demands on comprehension abilities. Observationally, participants often

struggled to understand the story and often had to re-read it. Therefore, it is difficult to ascertain whether incorrect answers were due to comprehension or false-belief difficulties. The last two questions required a yes/no answer, meaning responses may have been guessed. The task is typically acted out with a model village/dolls. It was felt this would be too childlike or patronising for adults. Therefore an alternative version and scoring system was used (Bibby & McDonald, 2005). This may have impacted on the scores and relationships found. Finally, the task is scored from 0-5, whereas some of the EF tests had a larger range of scores. This may have impacted when correlating these scores.

Contrasting the correlation co-efficients suggested there were some significant differences between groups. However, there generally was not a difference between groups in the nature of the relationship between ToM and EF.

4.3. Limitations

The small sample size reflects the difficulty of conducting research with a clinical sample. However, small sample sizes are accepted in ABI research due to the non-homogeneity of this population and it is common for single-case studies to be presented (Wilson, 1992).

Participants were not matched. Therefore, reflection of potential bias in the neurologically healthy control group is important when considering the findings. It is interesting to reflect on why participants consented to taking part (e.g.

motivation, self confidence in own skills) and how this further impacts on the results.

Some studies investigated the injury site of ABI participants in relation to performance on ToM tasks or tests of EF (Apperly et al., 2004). Due to the small sample size, lack of information in some clinical notes and some participants had diffuse damage, this could not be examined in this study. This is a potential limitation as the group is non-homogenous. Therefore, this needs to be considered when interpreting the results as a group finding. It should also be taken into account when considering the clinical implications of the findings to an ABI group.

The age of injury varied amongst the ABI participants, with some acquiring their brain injury as children. Therefore the impact of the injury and recovery may have been varied for all participants. This may further add to the non-homogeneity of the sample.

In terms of the measures, the Ice-Cream Van task did not appear to be a reliable or valid measure. It was difficult to ascertain which ToM tasks would be most appropriate for adults with ABI. The Eyes test (Baron-Cohen, Jolliffe, Mortimore & Robertson, 1997) may have suitable for this study as it was designed for adults, is a nonverbal test and claims to be free of many cognitive demands.

In terms of the ABI group, there were obviously no pre-morbid measures of ToM or EF. It is interesting to consider that perhaps ToM or EF impairments may be contributors in ABI rather than just a consequence.

It could be argued that using retrospective neuropsychological data is a limitation however the justifications for using this has been discussed earlier. Research has found that although cognitive rehabilitation programmes improve functional abilities, cognitive measures do not significantly change (Mills, Nesbada, Katz & Alexander, 1992). Scores on tests of intellectual functioning in ABI do not necessarily change with time (Anderson & Bigler, 1995). Research has found that just over 62% of adults with ABI in inpatient rehabilitation remained unchanged on neuropsychological tests. Some of the ABI participants acquired their brain injury as a child and research has shown that neuropsychological outcomes in children with ABI, show improvement in the first year but this then plateaus with time (Yeates, Taylor, Wade, Drotar, Stancin & Minch, 2002).

It was not possible to control for IQ in the ABI group due to the WAIS-III subtest scores being varied and therefore not a true reflection of intellectual abilities. Some research has found that ToM impairments may be related to intelligence in schizophrenia (Brune, 2003). Specific subtests on IQ tests have been related to ToM impairments in ASD (Happe, 1994).

4.4 Future Research and Clinical Implications

This ABI group performed significantly poorer than the neurologically healthy group on specific ToM tasks. This supports the need for a more in-depth

assessment and treatment of social functioning with this client group. As discussed earlier, rehabilitation in ABI is mainly focused on neuropsychological or behavioural assessment, treatment and outcome. Whilst neuropsychological and behavioural outcomes are imperative in ABI rehabilitation, social functioning needs to be addressed too. Difficulties in social functioning have been argued to be the most disabling aspect of ABI (Kinsella, Packer & Olver, 1991). Therefore, it is clinically important that this issue is addressed in rehabilitation. ToM or social skills interventions have been largely delivered to typically developing children (Hale & Tager-Flusberg, 2003) or individuals with ASD (Ozonoff & Miller, 1996) with the latter providing poor results. Intervention approaches for individuals with schizophrenia have been developed (Roncone, Mazza, Frangou, De Risio, Ussorio, Tozzini & Casacchia, 2004) and although in the early stages, they provide promising hope for the rehabilitation of ToM impairments. As far as the author is aware there are no studies to date that explore ToM interventions with an ABI population. Therefore this is clearly both a research and clinical need.

This study found that specific ToM tasks had positive relationships with specific symptoms and tests of EF. This needs to be further explored with a larger sample size which may allow for specific features of EF to be identified as being central to the relationship. A better understanding of this relationship in ABI could be considered in the design of clinical interventions for social and emotional functioning.

4.5 Conclusion

The results need to be interpreted with caution in light of the small sample size and methodological limitations highlighted. It was found that the ABI group preformed significantly poorer than neurologically healthy group on a second-order and higher-order ToM task. Limited relationships were found between performance on ToM tasks and tests of EF. The results indicate clinical implications, but further research addressing the limitations is needed to provide more support for these findings.

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Chapter 3: Reflective Paper:

The Reflective Journey

Word Count: 3,177

1. Introduction

Within this paper, I will reflect on the process of completing a thesis for a doctorate in Clinical Psychology. I will reflect on my personal and professional development. I will also discuss how clinical experiences have contributed to the research process and vice versa.

I will use similar titles to that used in empirical papers, allowing for a reflective account of each stage of the research process.

To begin, it is important to consider the idea of reflection. Reflecting is a “complex and deliberate process, of thinking about and interpreting experience in order to learn from it” (Atkins & Murphy, 1995 pp.33). Reflecting involves “internally examining and exploring issues of concern, triggered by an experience, which creates and clarifies meaning in terms of self, and which results in a changed conceptual perspective” (cited in Atkins & Murphy, 1995 pp.33). I feel the last part of this quote concerning change is relevant to my own development in reflecting. I feel that previously I would reflect back on an experience, but would not always apply it to facilitate change.

Schon (1987) discriminates between two styles of reflection; reflection-on-action and reflection-in-action. Reflection-on-action occurs after the event and leads to development of skills, understanding and future practice. Reflection-in-action occurs during the event and action is taken while still in the situation. I feel that my reflection is largely on-action, therefore I reflect after the event. However, I

noticed that during the research project I have developed my skills in reflecting in-action.

1.1 Developing the Research Idea

When considering the research idea, I reflected back on my experiences in psychology both academically as an undergraduate and clinically as an assistant psychologist. As an undergraduate, I was interested in teaching on developmental psychology and neuropsychology. I then worked as an assistant psychologist and my clinical posts allowed me to apply my undergraduate teaching and interests to a clinical setting. I developed an interest in theory of mind (ToM) whilst working within a child development centre, incorporating theory-practice links to the assessment of children where autistic spectrum disorder (ASD) was queried. In this clinical post, I carried out literature searches to ascertain which ToM tests would be most appropriate to use as part of the clinical psychology assessment. I found this incredibly difficult due to the overwhelming amount of literature in this area.

Within another clinical post in a neurobehavioural acquired brain injury (ABI) unit, I gained experience of administering neuropsychological tests including carrying out assessments of executive functioning (EF). I became increasingly interested in the more ecologically valid assessments of EF and how this seemed to better reflect the individuals' everyday observable skills and needs.

Whilst considering my research project, I reflected on my clinical experiences and specific interests in individuals with ASD and ABI. I then began to consider

my academic interests in ToM and EF and how the two may be related. After completing a literature search and reading more around this subject area, my interest grew. I had an academic interest in the area, but could also envisage the clinical applications of such research. I found that the majority of the research had been carried out with typically developing pre-school children or individuals with ASD. Reflecting on my own interests, academic experiences as well as gaps and possible developments in the current research, I decided to focus upon an ABI population.

1.2 Deciding on Theory of Mind Tests

I had to consider which ToM assessments would be most suitable to test my hypotheses and also be appropriate for individuals with ABI. I found it challenging to decide which ToM tests to use, matching my experience in clinical posts. I looked at previous research papers to ascertain which tests were commonly used with individuals with ABI. I found it difficult to find many commonalities. I decided upon a ToM test with reduced language and executive demands as it appeared to be a purer measure of ToM, was specifically designed for use with more impaired participants and fitted with my research question. As this test is not a widely used and recognised measure of ToM and only measures second-order ToM, I decided I needed other measures. The more traditional tests of ToM were designed for use with children. I was aware that due to this, the tests were very childlike e.g. using dolls. I reflected back to my clinical experiences of working with individuals with ABI and the difficulty of adapting theoretical models e.g. cognitive behavioural therapy (CBT) without being too childlike and patronising. I therefore carefully considered the tests I used, by

reflecting on my clinical experience whilst also considering the research literature.

1.3 Ethical and Clinical Issues of the Research Idea

I considered the ethical and clinical issues of the research by reflecting back to my clinical posts. I decided to data collect in a neurobehavioural brain injury unit I had previously worked in. I felt this allowed a greater understanding into the types of clinical participants I could potentially recruit. This helped when considering issues such as testing time and designing participant information sheets.

I considered the recruitment of participants from different ethnic backgrounds. I decided that the participants recruited would need to speak English as a first language. This is due to the fact that the neuropsychological tests being used were standardised on an English speaking population. All of the tests chosen required an understanding of the English language, both written and verbal. This meant I had potentially unethical exclusion criteria. When reflecting on Britain as a multi-cultural society with diverse cultures and languages spoken, the lack of neuropsychological tests and ToM tasks in languages other than English is surprising.

2. Method

2.1 Time Constraints

The data collection phase was undoubtedly the most stressful and where I experienced the most anxiety (this is reflected through the length of this section!). My data collection was time consuming. I was aiming to recruit twenty participants in each group. This meant a potential testing time of sixty hours! As I did not achieve my target number, testing time amounted to approximately forty-three hours, plus approximately another twenty-seven hours for scoring. I felt as if there was a time bomb that would explode before I could complete the testing. I was also anxious about the data analysis looming, feeling my statistical knowledge was not a particular strength. During this time I had two dreams about my clinical supervisor which I feel reflect my anxiety. I will discuss and reflect on these dreams in the context of the relevant dream research and theories, however it is not intended to be a full dream analysis.

There is no definite evidence regarding the function of dreams, however, various theories have been proposed. It has been argued that dreams can either serve physiological functions (Crick & Mitcheson, 1983; Globus, 1993; Hobson & McCarley, 1977, as cited in Cushway, 2008), process information by allowing the dreamer's experience from that day to integrate into their memories (Palombo, 1987, as cited in Cushway, 2008), process emotions (Kramer, 1992; Domhoff, 1993, as cited in Cushway, 2008) or can have multipurpose functions (Boss, 1977; Hunt, 1989, as cited in Cushway, 2008). When reflecting on dreams it is important to consider common themes and symbols and the individual

personal meaning this has for the dreamer. Other considerations include metaphors, puns, omissions, role reversals (cited, Cushway, 2008). Interpretation of dreams can occur at many different levels, but interpretation is only meaningful when it makes sense to the dreamer (cited, Cushway, 2008). Interpretation does not have to be carried out by a professional, there are many ways to interpret a dream including objective or subjective methods. As noted earlier, I am not attempting to present a full dream interpretation, but instead reflect on two dreams, which may aid an understanding of my anxiety and thought processes during this stage of the research.

In dream 1, I knocked on my supervisor's door to ask if he was coming to the canteen with me to have lunch. He told me he needed to go home during lunch time. I then saw him in the hospital grounds returning from lunch, he began talking to me but was incomprehensible. I asked him what he was talking about. He said to me "It is 1963". I said "It's not, it is 2008". He then said "Oh no, I fell at lunchtime, banged my head, went unconscious, and had to go to hospital. Do you think I have a brain injury?". I replied that I did not know. My supervisor then instructed me "Go and get an RMO". I ran off crying. I arrived outside the RMO's office and knocked on the door. The door opened and inside was an RMO who was Robert Kilroy Silk. I said to him that my supervisor "thinks he has a brain injury because he thinks it is 1963". He replied "Oh no, if he thinks it is 2003, he probably does have a brain injury". I told him "no he thinks it is 1963, not 2003". He replied "Oh no this is serious, quick lets go". He picked up a first aid box and had a stethoscope around his neck. We then ran to my supervisor's office. The RMO told me to stay outside as it was "serious". He then

entered my supervisor's office and shut the door. I remained outside the door crying and banging on it shouting to my supervisor "are you ok?". The RMO appeared every now again telling me to "go away" as it was "serious".

In dream 2, I knocked on my clinical supervisor's office door, I entered the room. The room was painted a deep red colour with gold furniture and my supervisor was lying on a chaise lounge. I asked him how to score a particular neuropsychological test. He queried why I did not know how to do this already. I told him there was not a manual to follow. He told me to "take the raw score and then subtract the number of trains that passed by my window on the day you did the testing". I asked how I would know how many trains had passed his window. He replied "I am not going to spoon feed you".

I discussed the dreams in supervision with my clinical supervisor (who was initially amused!), he encouraged the reflection of how these dreams may illustrate where I was currently in the research process. I will discuss these dreams in the context of using key questions, reflecting on the symbols, feelings and actions, looking at who or what is the adversary as well as the healing force. It will also include amongst many things, reflection on what the dreams may mean I am avoiding, what questions it raises, what I need to consider or accept and why I needed the dreams (cited, Cushway, 2008).

In dream 1, the main feeling was anxiety similar to my dominant feeling during the data collection stage. The important symbols were the stethoscope and first aid bag which in the dream would 'fix' my supervisor's brain injury, however I

felt unsure how these objects would help. This may reflect feelings during the data collection stage of being unsure how others could assist me, when help was offered. The main action of the dream was running, echoing my rush to finish data collection. The RMO is the healing force in the dream although he kept telling me to go away, so I did not know whether or not he had 'fixed' my supervisor. During the data collection stage, I felt an aspect of control taken away from me by having to rely on others to attend sessions booked. Often participants did not turn up or cancelled the session, metaphorically telling me to go away. The RMO however is also the adversary as he will not allow me to see my supervisor. This perhaps reflects a worry that all three of my supervisors are supervising other research projects or have other major commitments and their supervisees or commitments may restrict my access to them. In dream 1, the anxiety and upset about my supervisor's brain injury and the brain injury itself could reflect a dependency on all three supervisors and an anxiety that something may get in the way of them providing me with supervision. This dream perhaps suggested that during this stage, I felt time pressured and that I wanted to avoid responsibility.

In dream 2, the chaise lounge and red and gold colours were the most dominant symbols, indicating grandeur. This may reflect feelings of inferiority compared to all three supervisors, often thinking they hold all the answers to my research questions! The overriding feeling was that of confusion. This dream occurred a few days before a research meeting with my academic supervisor to discuss the data analysis. I was tense about my data analysis, feeling unsure about my knowledge of statistics. In dream 2 my clinical supervisor made a comment

about counting the trains passing by his window to generate an overall score for a neuropsychological test. This perhaps reflects my relationship with statistics, which I find confusing, yet to others seems obvious! The comment made by my supervisor in the dream that he would not spoon feed me, reflected an anxiety about feeling that I needed support during the data analysis, more than at any other stage. My supervisor was the adversary in the dream, challenging me and yet the healing force by encouraging me to find my own answers, thus facilitating independence. This perhaps reflects my stage in training and thoughts about the transition from trainee to qualified clinical psychologist. This dream suggested that I was questioning my skills and knowledge as the data analysis stage was coming closer. The dream facilitated an awareness and acceptance that I would need to discover and learn things for myself, rather than relying on supervisors.

2.2 Administering Tests of ToM and EF

The neurologically healthy group generally presented as slightly anxious and suspicious during testing. They often voiced concerns or queries about the testing “analysing” them and that they might get “worked out”. They often questioned whether things I had done or said, not as part of any test, was actually a test in its own right. For example, during testing with one participant, I was having difficulty with a stopwatch. The participant then asked at the end whether the ‘broken stopwatch’ was part of the test. These observations surprised me, as many of these participants had worked within the hospital for many years and appeared to have positive relationships with members of the clinical psychology team. These concerns and queries were perhaps what I would expect a

stereotypical layman's view of clinical psychology to be, but had not expected these perceptions from health care professionals working within multi-disciplinary teams. It made me reflect on the clinical psychologist's role within multi-disciplinary teams and question whether these perceptions were common across health care settings. The participants were generally anxious and suspicious of me, and therefore this may also be found in their professional relationships with clinical psychologists. I have struggled accepting this reflection, as I would not want to be perceived in this way by colleagues. I reflected on my experiences of working in inpatient settings where clinical psychology is usually one of a few disciplines that is not ward based. This has often led to some members of multi-disciplinary team querying what members of the clinical psychology team are doing when not on the ward. I wonder if this suspiciousness brings an element of curiosity. This may explain why the participants volunteered and why they presented in the way they did. These experiences impacted on reflection within my clinical work, for example reflecting on conflicts within the multidisciplinary team.

3. Data Analysis

The data analysis stage was not as anxiety provoking as I had initially expected. I surprised myself by how calm and relaxed I was during this stage. Reflecting on this, the data analysis allowed closure on the data collection phase and for the first time I could visualise the ending point of the project.

Due to the small sample size and numbers of scores generated by the measures, I had to consider carefully which statistical tests and significance level would be most appropriate. I did a preliminary analysis so I could explore the data. I decided to use two-tailed significance allowing for a more conservative analysis of the data. I initially produced many tables showing every correlation generated. I found it difficult to interpret my results as there were many pages and tables to work through. However, after discussion with my supervisors, it was decided that I should only present significant correlations or correlations with medium and large effect sizes. We decided that the remaining correlations could be presented in the appendix. This allowed for a clearer interpretation of the findings. Reflecting on this, I feel this process was extremely helpful in aiding my understanding of statistics and has helped to eradicate a lot of my fears of quantitative research designs.

4. Discussion

4.1 Clinical Implications

My results are able to be considered in terms of the clinical implications. The results suggest that individuals with ABI perform significantly lower on ToM tasks than neurologically healthy controls. The tests of EF were found to have specific but limited relationships with the ToM tasks. Reflecting on my experiences of working in ABI rehabilitation, the main focus has been on neurobehavioural outcome. This is due to behavioural disturbances being a significant barrier to rehabilitation. One of the main challenges in this setting is

co-ordinating rehabilitation goals and ensuring the whole team are able to reinforce and generalise new skills in all settings. However, with the appropriate training, role modelling and support, I have experienced that this is possible. The integration of reinforcing and generalising social skills into the neurobehavioural paradigm therefore seems feasible.

4.2 Future Research

The role of EF in ToM abilities still remains unclear and there is a need for this to be investigated further. Another way of examining this relationship is to consider the way in which ToM assessments are designed. In this study, a second-order ToM test was used which had reduced executive and language demands, allowing for a purer measure of ToM. However, ToM tests do not seem to be ecologically valid or do not always reflect ToM skills in everyday interactions.

4.3 Summary

To summarise, reflection has played a significant role during the research process. Reflecting on undergraduate and clinical experiences assisted in the generation of the research idea and design. This was of course supported by the literature and my supervisors. Reflecting on my anxiety allowed an understanding that this was perhaps associated with an avoidance of responsibility. Reflecting on the presentation of the neurologically healthy group during data collection, facilitated reflection of professional relationships within the multi-disciplinary team. I was then able to use these reflections during my

clinical placement. Reflection was important during the data analysis phase to aid the consideration of the clinical implications of the study as well as future research.

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**Appendix B Table of Studies (Literature Review
Paper)**

Table 1: Studies Included in the Review

Author	N	Population (Primarily Describing)	Type of Theory of Mind (ToM) Tasks	Training	Findings
1, Appleton & Reddy (1996)	Training Group (<i>n</i> = 23) Control (<i>n</i> = 23)	Typically Developing Children	First-Order ToM Tasks: Unexpected Contents Tasks Location Change Task	Training: Video enacting four location change ToM tasks. Corrective feedback was given to incorrect answers.	The training group had improved scored on close-transfer and distant-transfer ToM tasks.
2. Ashcroft, Jervis, Roberts (1999)	Training Group (<i>n</i> = 16)	Adults with learning disabilities (without ASD)	ToM Tasks: Pretend-play task First-Order and Second-Order Representations of False-Belief False desires Ascribing a story to a picture Location Change- (First-Order)	Training: Enacting first-order location change ToM task in pairs. Task shown in pictorial form with drawing of own head and a mind bubble to represent ideas/pictures in head. Shaping, modelling and positive reinforcement was used.	Significant improvement on close-transfer ToM tasks. Improvements transferred to a similar task.
3. Chin & Bernard-Optiz (2000)	Training (<i>n</i> = 3)	ASD	First-Order ToM Tasks: Unexpected Contents Tasks Location Change Task Second Order ToM Task	Training: Conversational skills were taught with children and care-givers. Children were videoed and encouraged with help to evaluate their progress.	Performance on first-order and second-order ToM tasks did not change with improved conversational skills

Table 1: Studies Included in the Review (Cont.)

Author	N	Population (Primarily Describing)	Type of Theory of Mind (ToM) Tasks	Training	Findings
4. Fisher & Happe (2005)	ToM group (n = 10) EF group (n =10) Control: (n = 7)	ASD	First-Order ToM Tasks: Location Change Task Unexpected Contents Tasks Deception Task Seeing leads to knowing Knowing/Guessing Other ToM tasks: Children’s “reading the mind in the eyes” False photograph	ToM Training: Beliefs as ‘photos on head’ (Swettenham, Baron-Cohen, Gomez & Walsh, 1996). Five stages, training to criterion. Training on first-order unexpected transfer ToM task. EF Training: ‘brain as a machine’, using ‘brain tools’. Five stages, training to criterion.	ToM Training Group: Significant increase in performance on close-transfer and distant-transfer ToM task. No improvement on EF tasks EF Training Group: Significant improvements on close-transfer and distant transfer ToM task. No improvement on EF task
5. Gevers, Clifford, Mager & Boer (2006)	Training Group (n = 18)	PDD-NOS	First-order and Second-Order ToM Task: The TOM test.	Training: Social Cognition Training (Steeneman, Jackson, Pelzer & Muris, 1996).	Significant progress on subdomains on the TOM test. Parental report showed significant progress in adaptive behaviour.
6. Hale & Tager-Flusberg (2003)	False-Belief (n = 20) Sentential Complements (n = 20) Relative Clauses (n = 20)	Normally developing children	First-Order ToM Task: Location change Task Unexpected contents Task Appearance reality	False-Belief Training: Enacted first-order location change ToM task, questions and corrective feedback. Sentential Complements Training: Story where character did action towards someone but says done it to another. Questions and corrective feedback.. Relative Clause Training: Enacted a story with identical twins and a character doing action. Questions about which twin received the action. Corrective feedback with complete relative clauses modelled.	False-belief and sentential training groups performed significantly better on all ToM tasks compared to relative clause group.

Table 1: Studies Included in the Review (Cont.)

Author	N	Population (Primarily Describing)	Type of Theory of Mind (ToM) Tasks	Training	Findings
7. Hadwin, Baron-Cohen, Howlin & Hill (1997)	Emotion group (n = 10) Belief group (n = 10) Pretence group (n = 10)	ASD	N/A	Emotion and Belief: Teaching external indicators of emotions of others and that emotions have beliefs and desires. Play: Teaching production and participation in pretend play through modelling and guidance	Significant improvements on emotion and belief tasks (Hadwin, Baron-Cohen, Howlin & Hill, 1996). There were no changes in communication skills.
8. Kayser, Sarfati, Besche & Hardy-Bayle (2006)	Video Group (n = 8, Control (n = 6)	Schizophrenia	First-Order: ToM task (cartoon strips)	Video Group: Twelve short scenes from French cinema films depicting various mental states.. Discussion, questions and encouragement to consider thoughts, feelings and desires of characters.	The main findings showed participants in the video group has possible improved communication skills and ability to infer other's intentions.
9. Kloo & Perner (2003)	Experiment 1: Total: (n = 60) Experiment 2: Card-Sorting Training: (n = 14) False-Belief Training: (n = 15) Control: (n = 15)	Normally developing children	Experiment 1: First-Order ToM Task: 2 Unexpected transfer tasks Experiment 2: First-Order ToM Task: Unexpected transfer task	Experiment 1: No Training Experiment 2: False Belief Training: Stories about false-beliefs and false statements administered with corrective feedback Card-Sorting: Card-sorting tasks were administered with corrective feedback. Control: Number conservation and relative clauses task were administered with corrective feedback.	Experiment 1: Correlation between a first-order ToM task and test of EF. Experiment 2: False-belief training led to improved performance on test of EF. Card Sorting training improved performance on test of EF and first-order ToM tasks.

Table 1: Studies Included in the Review (Cont.)

Author	N	Population (Primarily Describing)	Type of Theory of Mind (ToM) Tasks	Training	Findings
10. Knoll & Charman (2000)	Experiment 1: False-Belief Training: (n = 11) Control: (n = 11)	Normally developing children	Experiment 1: First-Order ToM Task: Version of unexpected transfer task Version of unexpected contents task	Experiment 1: False Belief Training: Combination of first-order unexpected transfer tasks with corrective feedback. In part A pictorial format was used. Part B used a three- dimensional object was used. Control: Story-time session	Experiment 1: False belief training group performed better on close- transfer false belief task than the control group. There was no generalisation to distant transfer tasks.
	Experiment 2: False-Belief Training: (n = 15) Visual Perspective Training: (n = 13) Control: (n = 16)		Experiment 2: As experiment 1	Experiment 2: False Belief Training: As experiment 1 Visual Perspective Training: Visual Perspective tasks with corrective feedback. Control: As experiment 1	Experiment 2: As above

Table 1: Studies Included in the Review (Cont.)

Author	N	Population (Primarily Describing)	Type of Theory of Mind (ToM) Tasks	Training	Findings
11. Lohmann & Tomasello (2003)	Full Training Verbs (<i>n</i> = 24) Full Training Communication Verbs: (<i>n</i> = 24) Discourse Only (<i>n</i> = 30) No Language (<i>n</i> = 30) Sentential Complements (<i>n</i> = 30)	Normally developing children	First Order ToM Task: Unexpected Contents Appearance Reality Location change	Full Training: Deceptive aspects of tasks were highlighted using mental state verbs, communication verbs within sentential complements. Corrective feedback was given. Discourse Only Training: Deceptive aspects of tasks were highlighted without using mental state verbs or sentential complement constructions. Corrective feedback was given No Language Training: Deceptive aspects of tasks were highlighted nonverbally. Sentential Complement Only Training: Deceptive aspects of tasks were not highlighted. Corrective feedback was given	Sentential complements training, led to a significant change on close-transfer and distant-transfer first-order ToM tasks.
12. McGregor, Whiten & Blackburn (1996)	ASD Training Group (<i>n</i> = 8) ASD Control: (<i>n</i> = 8) Typically Developing Children: (<i>n</i> = 16) Typically Developing Children (<i>n</i> = 16)	ASD	First Order: Location Change Task Unexpected Content Task Deception Task Alternative Unexpected Task Deception Tasks Appearance-Reality Task	Training: Error-less learning techniques. Progression through the different programmes according to performance. Programme A – Training on first-order unexpected transfer ToM task. Programme B - Training on first-order unexpected transfer ToM task using dolls with pictures in head to represent thoughts and intention. Programme A2 – Same as A but strategic aids phased out.	Typically Developing Children had improvement on close-transfer and a distant transfer ToM task(s). Individuals with ASD had improvement on close-transfer ToM tasks but not on a distant-transfer ToM task.

Table 1:Studies Included in the Review (Cont.)

Author	N and Mean Age	Population (Primarily Describing	Type of Theory of Mind (ToM) Tasks	Training	Findings
13. Melot & Angeard (2003)	Appearance Reality Training (n = 31) False-Belief Training (n = 31) Control: (n = 31)	Normally developing children	First Order ToM Task: Three unexpected transfer sketches	False-Belief Training: Testing twice on false-belief task and giving corrective feedback. Appearance Training: Testing twice on appearance reality task and giving corrective feedback Control: Testing on the false-belief and appearance reality tasks. No feedback was given	Both training groups showed improvement on close-transfer and distant-transfer ToM tasks.
14. Oznoff & Miller (1995)	Training Group: (n = 5) Control: (n = 4)	ASD	First-Order ToM Task: Unexpected Contents 2 Second-Order ToM Tasks Higher-Order ToM Task	Training: The first unit addressed basic interaction and conversational abilities. The second unit addressed perspective-taking and ToM skills by enacting first-order and second-order ToM tasks. Community outings with focus on social skills.	Improvement on close-transfer first-order and second-order ToM tasks
15. Roncone, Mazza, Frangou, De Risio, Usoorio, Tozzini, Casacchia (2004)	Rehabilitation Group: (n = 10) Control (n = 10)	Schizophrenia	First-Order and Second-Order Tom Tasks Theory of Mind Stories (with cartoon drawings)	Rehabilitation Group: Based on Feurstien’s Instrumental Enrichment Programme (IEP). Exercises and mediated learning.	Rehabilitation group showed improvements in verbal fluency, planning behaviour competence, first-order and second-order ToM tasks, strategic thinking and social functioning.

Table 1:Studies Included in the Review (Cont.)

Author	N	Population (Primarily Describing)	Type of Theory of Mind (ToM) Tasks	Training	Findings
16. Slaughter & Gopnik (1996)	Experiment 1: Belief group (n = 11) Coherence group (n = 11) Control (n = 11)	Normally developing children	Experiment 1: First-Order ToM task Appearance-reality Unexpected contents	Experiment 1: Belief Training: Practice first-order unexpected content task with feedback. Coherence Training: Desire and perception tasks with questions about current and retrospective self and other belief with feedback. Control: Training on number conservation	Experiment 1: Belief and coherence training groups had improvement on performance on close-transfer first-order ToM task.
	Experiment 2: Belief group (n = 13) Coherence group (n = 13) Control (n = 13)		Experiment 2: As experiment 1	Experiment 2: Belief Training: As experience 1 Coherence Training: As experiment 1 Control: Similar to a language control task. Unexpected contents type task with a different grammatical form to the training groups.	Experiment 2: Belief and coherence training groups both had improvement on performance on close-transfer and distant-transfer ToM tasks..
17.Steernemann, Jackson, Pelzer & Muris, (1996)	Training (n = 8) Control I Education Difficulties (n =8) Control II Behaviour Problems (n =8) Control III Mainstream School	Typically Developing Children with anxiety and aggression	First Order ToM Task: Location Change Task Unexpected Transfer Task	Training: Comprised of 173 activities focussing on making friendships, listening, fantasy and reality, intentions, emotion recognition, placing self in other's thoughts and feelings. Activities included enacting first-order ToM tasks.	The trained children performed better than controls at post test and four months follow up on first-order false-belief tasks. Improvement in making friendships and a decrease in being bullied was reported by parents.

Table 1: Studies Included in Review (cont.)

Author	N and Mean Age	Population (Primarily Describing	Type of Theory of Mind (ToM) Tasks	Training	Findings
18. Sweetenham (1996)	Training Groups: ASD (<i>n</i> = 8)	ASD	First Order ToM Task: Sally-Ann Task	Computer Instruction Program: Computerised version of Sally-Ann task.	Main findings showed all groups showed improvement on computerised ToM task (close-transfer). ASD group could not pass distant transfer tasks.
	Down's Syndrome (<i>n</i> = 8)		Sally-Ann Task (computerised version)	Music and text on screen providing positive feedback. For incorrect answers, a message appeared next to character i.e. 'I think the ball is....'	
	Typically Developing Children (<i>n</i> = 8)		-Smarties Task False-belief Breakfast Task The Tom task		

Appendix D Ice-Cream Van Task – Story given to participants

John and Mary are in the Park when they see an ice-cream truck. Mary would like to buy an ice-cream but has no money with her. The ice-cream man tells her to go home and get her money because he will be staying in the park all day. Mary goes home and John stays in the park. Then the ice-cream man tells John he is moving to the church. He drives off and John goes home. On his way to the church the ice-cream man meets Mary and tells her where he is going. They arrange to meet at the church so Mary can buy her ice-cream. Later John goes to Mary's house. Her sister says she has gone to buy ice-cream. John goes to look for Mary in the park.

Appendix E Consent
– Adapted Video Based False-Belief Test

UNIVERSITY OF
BIRMINGHAM

School of Psychology

From the desk of

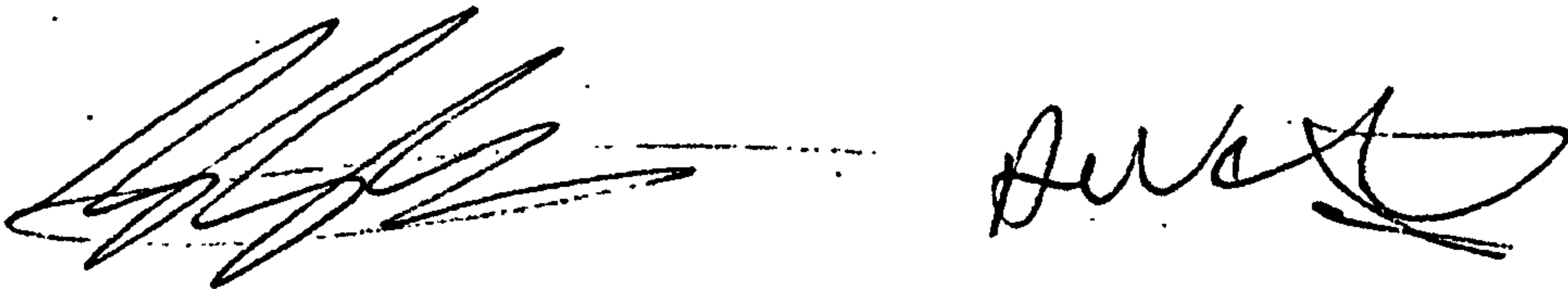
Dr. Ian Apperly

02/02/2007

To Whom It May Concern:

I and my PhD student Adam Qureshi have sole intellectual property over the sequential picture presentation experimental task for testing "theory of mind" in adults, which Dr Ian Hume and Jenny Churchley are proposing to use. We are happy for these researchers to use our task and to be involved in any work arising from this project that makes use of our task.

Yours truly

Two handwritten signatures are present. The signature on the left is a stylized, cursive signature, likely belonging to Ian Apperly. The signature on the right is also cursive and appears to be 'Adam Qureshi'.

Ian Apperly and Adam Qureshi

Appendix F Fax Pas Recognition Task
– Example Story

V. Stone FP test
S. Baron-Cohen

4. Jill had just moved into a new apartment. Jill went shopping and bought some new curtains for her bedroom. When she had just finished decorating the apartment, her best friend, Lisa, came over. Jill gave her a tour of the apartment and asked, "How do you like my bedroom?" "Those curtains are horrible," Lisa said. "I hope you're going to get some new ones!"

Did anyone say something they shouldn't have said or something awkward?

If yes, ask:

Who said something they shouldn't have said or something awkward?

Why shouldn't he/she have said it or why was it awkward?

Why do you think he/she said it?

Did Lisa know who had bought the curtains?

How do you think Jill felt?

Control question: In the story, what had Jill just bought?

How long had Jill lived in this apartment?

Appendix G Multiple Errands Task

– Instructions for Participants

INSTRUCTIONS

In this exercise you should complete the following three tasks:

1) You should buy the following items

- | | |
|--------------------|-------------------|
| small brown loaf | bar of chocolate |
| packet of plasters | single light bulb |
| birthday card | key ring |

2) You should obtain the following information and write it down in the spaces below

1. What is the headline from either today's 'Daily Mail', 'Daily Mirror' or 'The Sun' newspaper?
2. What is the closing time of the library on Saturday?
3. What is the price of 1 pound or kilogram of tomatoes?
4. How many shops sell televisions?

3) You must meet me under the clock 20 minutes after you have started this task and tell me the time.

TELL THE PERSON OBSERVING YOU WHEN YOU HAVE COMPLETED THE EXERCISE

Whilst carrying out this exercise you must obey the following rules:

- ▶ You must carry out all these tasks but may do so in any order
- ▶ You should spend no more than £6.50
- ▶ You should stay within the limits of the upper floor of the shopping centre
- ▶ No shop should be entered other than to buy something
- ▶ You should not go back into a shop you have already been in
- ▶ You should not buy any item from the stalls
- ▶ You should buy no more than 2 items in Tesco
- ▶ Take as little time to complete this exercise without rushing excessively
- ▶ Do not speak to the person observing you *unless* this is part of the exercise

**Appendix K Invitation Letters, Information Sheets,
Consent Forms, RMO Letter, Debrief
Sheet**

– Given to all participants

Clinical Participants - Version 1 – June 2007

Executive Function and Theory of Mind in Adults with Brain Injury

Dear Participant

You are invited to take part in research. The research is looking at theory of mind and executive functioning in adults with brain injury. Theory of mind is when someone is able to make a guess about the belief of another person. Executive functioning involves skills such as planning, organising, following rules and working memory.

This research will involve taking part in some short tests of theory of mind. It will take approximately 50 minutes of your time. Information from your file will be copied and used as part of the research. Please read the participant information sheet for more information.

If you take part in this research you will be entered into a draw with approximately 39 other people for the chance to win a £25 voucher for a high street shop of your choice.

If you would like to take part please let Professor Nick Alderman or Jenny Churchley know. You can contact them directly (contact details on information sheet) or ask a member of staff to do this on your behalf.

Thank you.

Yours sincerely,

**Jenny Churchley
Trainee Clinical Psychologist.**

Non-Clinical Participants - Version 1 – June 2007

Executive Function and Theory of Mind in Adults with Brain Injury

Dear Participant

You are invited to take part in research. The research is looking at theory of mind and executive functioning in adults with brain injury. Theory of mind is when someone is able to make a guess about the belief of another person. Executive functioning involves skills such as planning, organising, following rules and working memory.

This research will involve taking part in some short tests of theory of mind and some tests of executive functioning. It will take approximately two hours of your time. This will be a 50 minute session and a one hour and ten minutes session. Please read the information sheet for more information.

If you take part in this research you will be entered into a draw with approximately 39 other people for the chance to win a £25 voucher for a high street shop of your choice.

If you would like to take part please let Professor Nick Alderman or Jenny Churchley know. You can contact them directly (contact details on information sheet) or ask a member of staff to do this on your behalf.

Thank you.

Yours sincerely,

**Jenny Churchley
Trainee Clinical Psychologist.**

Programme Director
Doctorate Course in Clinical Psychology
Professor Delia Cushway
BA (Hons) MSc PhD AFBPS CPsychol (Clin Foren)

Participant Information Sheets – Clinical Participants
Version 3 - October 2007
Executive Function and Theory of Mind in Adults with Brain Injury

You have been asked to take part in some research. Before you decide whether to take part you should read this sheet carefully.

Part One will explain why the research is taking place.

Part Two will explain the how the research will be carried out.

PART ONE

Purpose of the study

This study is looking at the relationship between theory of mind and executive functioning in individuals with brain injury. Theory of mind is when you are able to make a guess at the beliefs of others. Executive functioning includes skills such as planning, organising, working memory, being able to switch rules. This study will involve completing tests of theory of mind.

The results of this study may add to the assessment and rehabilitation of individuals with brain injury.

Why you have been chosen

You have been chosen to take part in this research. This is because you have a brain injury.

Taking part

You do not have to take part in this research. You will be asked to sign a consent form if you do agree.

What will happen

The research will be finished in May 2008. If you decide to take part, you will be asked to give approximately 50 minutes of your time. This does not have to be all at once. You will complete some tests of theory of mind. Testing will take place at Kemsley, St Andrews Health Care. Previous tests of executive functioning scores and IQ scores will be taken from your file and used in the research.

Participant Information Sheets – Clinical Participants

Version 3 - October 2007

Executive Function and Theory of Mind in Adults with Brain Injury

After you have taken part you will be given a debrief sheet and the opportunity to have time with the researcher if requested. You will also have an executive summary of the research and have the option of having a copy of the empirical paper and literature review.

Expenses and Payments

Taking part in the research will not cost you any money

As a thank you for taking part in the research you will be put into a draw to win a voucher for £25 for a high street shop of your choice.

Possible Disadvantages/Risk

There are not any predicted disadvantages or risks to taking part in this research.

Possible Advantages/Benefits

It cannot be promised that the research will directly be of benefit to you. It is hoped that the research may help with the specific assessment and treatment of people with brain injury.

Complaints

If you have a complaint about anything with research, this will be dealt with. This is explained in part two.

Contact Details

If you have any questions, concerns or comments at any stage during the research, please contact:

Jenny Churchley
Trainee Clinical Psychologist
Clinical Psychology Department
James Starling Building
Coventry University
Priory Street
Coventry
CV5 5FB

NB: St Andrews e-mail address to be added here

Changing Your Mind

If at any point you do not want to take part in the research for whatever reason, you can withdraw. Any information/data collected will be destroyed.

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Participant Information Sheets – Clinical Participants

Version 3 - October 2007

Executive Function and Theory of Mind in Adults with Brain Injury

To withdraw, you should contact a member of the research team or ask a member of staff to do this on your behalf.

PART TWO

What to do if there is a problem

If you have a problem concern or complaint you should contact either:

The researchers

1) Jenny Churchley

Trainee Clinical Psychologist
Clinical Psychology Department
James Starling Building
Coventry University
Priory Street
Coventry
CV51 5FB
jchurchley@standrew.co.uk

2)

Dr Ian Hume

Senior Lecturer
James Starling Building
Coventry University
Priory Street
Coventry
CV1 5FB
i.hume@coventry.ac.uk

3) Professor Nick Alderman

Consultant Clinical Neuropsychologist
Kemsley – St Andrews Health Care
St Andrews Hospital
Northampton
NN1 5DG
nalderman@stah.org.uk

If you do not wish to make a complaint to the researchers, you can make a formal complaint through the NHS Complaints Procedure. Please ask the researchers or a member of staff at St Andrews Hospital about how to do this.

Or contact:

Independent Contact:

Jeanette Collyer

Complaints Manager

St Andrews Healthcare

Biling Road

Northampton

NN1 5DG

jcollyer@standrew.co.uk

Harm

There is not any predicted harm when taking part in this research. However, if

Page 3

Programme Director
Doctorate Course in Clinical Psychology
Professor Delia Cushway
BA (Hons) MSc PhD AFBPS CPsychol (Clin Foren)

Participant Information Sheets – Clinical Participants

Version 3 - October 2007

Executive Function and Theory of Mind in Adults with Brain Injury

you are harmed because of this research due to negligence, you may be able to take legal action against Coventry University, but you may have to pay for your legal costs.

Confidentiality and Anonymity

If you take part in this research, your health records will be accessed. Information on scores for tests of executive functioning; IQ and details of your brain injury will be copied. This information will be used in the research.

Your age and gender will be recorded. Your name will be recorded and a numerical code will be attached to your name. The numerical code will be used on all recording sheets. Your name and corresponding code will be kept at a locked cupboard in Kemsley. Only Jenny Churchley and Nick Alderman will have access to this. It is hoped that this research will be published; your name will not be used in the research.

If at any time during the research you tell the researcher information which suggests you or someone else is at risk of harm to themselves or others, this will have to be shared with relevant others. It is hoped that if this occurs, you would be informed first.

Psychiatry, Nursing and Therapy Team

The psychiatrist that works with you will be told that you are taking part in the research. The other members of staff on your ward will not necessarily be told you are taking part in the research. However, they may need to be informed when arranging a time to meet with you or they may see you with members of the research team.

The Results

The results of the study are hoped to be published. You will not be identified in the report.

Review of the study

The Leicestershire, Northamptonshire and Rutland Research Ethics Committee board have reviewed this study and granted ethical approval.

Thank you for taking time to read this sheet – if you have any further questions please contact a member of the research team.

Please keep this copy. If you misplace it please contact the research team who can give you another copy.

Page 4

Dean of Faculty of Health and Life Sciences
Dr Linda Merriman Mphil PhD DpodM CertEd Coventry University Priory Street Coventry CV1 5FB Tel 024 7679 5805

Chair of Department of Psychology
Professor Koen Lamberts BA BSc MSc PhD University of Warwick Coventry CV4 7AL Tel 024 7652 3098

Participant Information Sheets – Non -Clinical Participants

Version 3 - October 2007

Executive Function and Theory of Mind in Adults with Brain Injury

You have been asked to take part in some research. Before you decide whether to take part you should read this sheet carefully.

Part One will explain why the research is taking place.

Part Two will explain the how the research will be carried out.

PART ONE

Purpose of the study

This study is looking at the relationship between theory of mind and executive functioning in individuals with brain injury. Theory of mind is when you are able to make a guess at the beliefs of others. Executive functioning includes skills such as planning, organising, working memory, being able to switch rules. This study will involve completing tests of theory of mind and executive functioning and a short test of IQ.

The results of this study may add to the assessment and rehabilitation of individuals with brain injury.

Why you have been chosen

You have been chosen to take part in this research. This is because you do not have a brain injury and you are a member of staff at Kemsley – St Andrews Health Care, St Andrews Hospital.

Taking part

You do not have to take part in this research. You will be asked to sign a consent form if you do agree.

Participant Information Sheets – Non -Clinical Participants
Version 3 - October 2007
Executive Function and Theory of Mind in Adults with Brain Injury

What will happen

The research will be finished in May 2008. If you decide to take part, you will be asked to give approximately 2 hours of your time. This does not have to be all at once. You will complete some tests of executive function and theory of mind and a short test of IQ. Testing will take place at Kemsley, St Andrews Health Care, St Andrews Hospital and at a shopping centre, Weston Favels. After you have taken part you will be given a debrief sheet and the opportunity to have time with the researcher if requested. You will also have an executive summary of the research and have the option of having a copy of the empirical paper and literature review.

Expenses and Payments

You may incur expenses as a result of taking part of this research. The only costs you would incur would be travel/parking expenses if applicable.

As a thank you for taking part in the research you will be put into a draw to win a voucher for £25 for a high street shop of your choice.

Possible Disadvantages/Risk

There are not any predicted disadvantages or risks to taking part in this research.

Possible Advantages/Benefits

It cannot be promised that the research will directly be of benefit to you. It is hoped that the research may help with the specific assessment and treatment of people with brain injury.

Complaints

If you have a complaint about anything with research, this will be dealt with. This is explained in part two.

Contact Details

If you have any questions, concerns or comments at any stage during the research, please contact:

Jenny Churchley
Trainee Clinical Psychologist
Clinical Psychology Department
James Starling Building
Coventry University
Priory Street
Coventry
CV5 5FB

ichurchley@standrew.co.uk

Dean of Faculty of Health and Life Sciences

Dr Linda Merriam Mphil PhD DpodM CertEd Coventry University Priory Street Coventry CV1 5FB Tel 024 7679 5805

Chair of Department of Psychology

Professor Koen Lamberts BA BSc MSc PhD University of Warwick Coventry CV4 7AL Tel 024 7652 3096

Participant Information Sheets – Non -Clinical Participants

Version 3 - October 2007

Executive Function and Theory of Mind in Adults with Brain Injury

Changing Your Mind

If at any point you do not want to take part in the research for whatever reason, you can withdraw. Any information/data collected will be destroyed. To withdraw, you should contact a member of the research team.

PART TWO

What to do if there is a problem

If you have a problem, concern or complaint you should contact either:

The researchers

1) Jenny Churchley

Trainee Clinical Psychologist
Clinical Psychology Department
James Starling Building
Coventry University
Priory Street
Coventry
CV1 5FB
jchurchley@standrew.co.uk

2) Dr Ian Hume

Senior Lecturer
James Starling Building
Coventry University
Priory Street
Coventry
CV1 5FB
i.hume@coventry.ac.uk

3) Professor Nick Alderman

Consultant Clinical Neuropsychologist
Kemsley – St Andrews Health Care
St Andrews Hospital
Northampton
NN1 5DG
n.alderman@stah.org.uk

If you do not wish to make a complaint to the researchers you can make a formal complaint through the NHS Complaints Procedure. Please ask the researchers or a member of staff at St Andrews Hospital about how to do this.

Or contact:

Independent Contact:

Jeanette Collyer
Complaints Manager
St Andrews Healthcare
Biling Road
Northampton
NN1 5DG

jcollyer@standrew.co.uk

Page 3

Programme Director
Doctorate Course in Clinical Psychology
Professor Delia Cushway
BA (Hons) MSc PhD AFBPS CPsychol (Clin Foren)

Participant Information Sheets – Non -Clinical Participants

Version 3 - October 2007

Executive Function and Theory of Mind in Adults with Brain Injury

Harm

There is not any predicted harm when taking part in this research. However, if you are harmed because of this research due to negligence, you may be able to take legal action against Coventry University, but you may have to pay for your legal costs.

Confidentiality and Anonymity

If you take part in this research, your health records will not be accessed.

Your age and gender will be recorded. Your name will be recorded and a numerical code will be attached to your name. The numerical code will be used on all recording sheets. Your name and corresponding code will be kept at a locked cupboard in Kemsley. Only Jenny Churchley and Nick Alderman will have access to this. It is hoped that this research will be published; your name will not be used in the research.

If at any time during the research you tell the researcher information which suggests you or someone else is at risk of harm to themselves or others, this will have to be shared with relevant others. It is hoped that if this occurs you would be informed first.

Family Doctor/General Practitioner

Your family doctor/general practitioner will not be informed of your involvement in this research.

The Results

The results of the study are hoped to be published. You will not be identified in the report.

Review of the study

The Leicestershire, Northamptonshire and Rutland Research Ethics Committee board have reviewed this study and granted ethical approval.

Thank you for taking time to read this sheet – if you have any further questions please contact a member of the research team.

Please keep this copy. If you misplace it please contact the research team who can give you another copy.

Page 4

Dean of Faculty of Health and Life Sciences
Dr Linda Merriman Mphil PhD DpodM CertEd Coventry University Priory Street Coventry CV1 5FB Tel 024 7679 5805

Chair of Department of Psychology
Professor Koen Lamberts BA BSc MSc PhD University of Warwick Coventry CV4 7AL Tel 024 7652 3096

Version 3 – October 2007

Centre Number _____

Study Number _____

Participant Identification Number for this trial _____

CONSENT FORM – CLINICAL PARTICIPANTS

Executive Function and Theory of Mind in Adults with Brain Injury

Researcher: Jenny Churchley, Trainee Clinical Psychologist

Please initial the boxes

1. I confirm that I have read and understood the information sheet dated October 2007 version 3 for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.
2. I understand that I am a volunteer in this research and I can withdraw at any time. I do not have to give a reason to withdraw and it will not affect my health care.
3. I understand that information and from my medical notes and scores of tests of executive functioning and IQ as stated on the participant information sheet will be copied and used as part of the research.
4. I agree that the results for this research can be shared with other rehabilitation professionals i.e. therapists, nurses, doctors etc at staff training, conferences and in professional journals.
5. I confirm that I agree to take part in the above study

☐
☐
☐
☐
☐

_____/_____/____

Participant Name

Date

Signature

_____/_____/____

Researcher

Date

Signature

_____/_____/____

Name of person taking
 consent if not researcher

Date

Signature

When complete, 1 copy to participant, 1 copy for researcher site file

Version 2 – October 2007

Centre Number _____

Study Number _____

Participant Identification Number for this trial _____

CONSENT FORM – NONCLINICAL PARTICIPANTS
Executive Function and Theory of Mind in Adults with Brain Injury
Researcher: Jenny Churchley, Trainee Clinical Psychologist

Please initial the boxes

1. I confirm that I have read and understood the information sheet dated October 2007 version 3 for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.
2. I understand that I am a volunteer in this research and I can withdraw at any time. I do not have to give a reason to withdraw and it will not affect my employment.
3. I confirm that I agree to take part in the above study.
4. I agree that the results for this research can be shared with other rehabilitation professionals i.e. therapists, nurses, doctors etc at staff training, conferences and in professional journals.

☐☐☐☐

_____	____/____/____	_____
Participant Name	Date	Signature
_____	____/____/____	_____
Researcher	Date	Signature
_____	____/____/____	_____
Name of person taking consent if not researcher	Date	Signature

When complete, 1 copy to participant, 1 copy for researcher site file

Version 2 – August 2007

Executive Function and Theory of Mind in Adults with Brain Injury

Dear Responsible Medical Officer,

Please be aware that _____
has agreed to take part in some research. The research is
examining the relationship between theory of mind and executive
functioning. It will involve participation in some short tests of theory
of mind. This will take approximately 50 minutes. Previous scores
from tests of executive functioning and IQ and details of the brain
injury will be taken from the clinical file. This will be accessed
through Professor Nick Alderman, Consultant Clinical
Neuropsychologist.

If you would like any further information please do not hesitate to
contact me on the University address above or Professor Nick
Alderman, Kemsley – St Andrews Health Care.

Thank you.

Yours sincerely,

Jenny Churchley
Trainee Clinical Psychologist

Debrief Sheet – Version 1 -August 2007

Executive Functioning and Theory of Mind in Adults with Brain Injury

Summary of Research and Aims

This research is looking at whether there is a relationship between people's scores on tests of executive functioning and tests of theory of mind.

The research also hopes to identify whether people with brain injury can pass theory of mind tests in the same way as people without brain injury.

Theory of mind interventions have been designed for people with autism and schizophrenia. If this research shows that people with brain injury have difficulties with passing theory of mind tests, it may point to a need for similar interventions.

This study is a research assignment for a PhD in Clinical Psychology. However, it is hoped that this study will be published.

Thank you

Thank you for taking part in this study, your time given is appreciated. As a thank you, you will be entered into a draw to win a £25 shopping voucher for a high street shop of your choice. If you have won, you will be contacted by May 2008. If you are not contacted by this point, you must assume you have not won the voucher.

Further Questions

If you have any further questions about the research, please contact Jenny Churchley, who will arrange to meet with you.

Jenny Churchley
Trainee Clinical Psychologist
Clinical Psychology Department
James Starling Building
Coventry University
Priory Street
Coventry
CV5 5FB

Jenny Churchley will be working at Kemplsey, St Andrews Health Care, St Andrews Hospital from October 2007 – March 2008. Therefore she can also be contacted via the Clinical Psychology Department.

Thank you again for taking part in the research.

Appendix L Results Tables

Table 1: Neurologically Healthy - Correlations between WTAR Predicted WAIS-III PIQ and tests of EF

	<i>R</i>	<i>N</i>	<i>P</i>	Effect
EF Test			(two-tailed)	
<u>MET-SV</u>				
Total Errors	.256	15	.358	Small
<u>BADS</u>				
Zoo Map	.419	15	.120	Medium
Modified Six Elements	-.367	15	.178	Medium
<u>DEX</u>				
DEX-Self	.048	15	.865	None

Table 2: Neurologically Healthy - Correlations between WTAR Predicted WAIS-III VIQ and tests of EF

	<i>R</i>	<i>N</i>	<i>P</i>	Effect
EF Test			(two-tailed)	
<u>MET-SV</u>				
Total Errors	.147	15	.600	Small
<u>BADS</u>				
Zoo Map	.312	15	.257	Medium
Modified Six Elements	-.374	15	.170	Medium
<u>DEX</u>				
DEX-Self	.023	15	.936	None

Table 3: Neurologically Healthy - Correlations between WTAR Predicted WAIS-III FSIQ and tests of EF

	<i>R</i>	<i>N</i>	<i>P</i>	Effect
EF Test			(two-tailed)	
<u>MET-SV</u>				
Total Errors	.259	15	.352	Small
<u>BADS</u>				
Zoo Map	.483	15	.068	Medium
Modified Six Elements	-.363	15	.184	Medium
<u>DEX</u>				
DEX-Self	.018	15	.948	None

Table 4: Neurologically Healthy - Correlations between WTAR Predicted WAIS-III PIQ and ToM tasks

ToM Task	<i>R</i>	<i>N</i>	<i>P</i> (two-tailed)	Effect
<u>Smarties</u>				
Belief-Self	-	15	-	-
Belief-Other	-	15	-	-
<u>Ice-Cream Van</u>				
Total Score	.436	15	.104	Medium
<u>Adapted Video-Based False Belief ToM Task</u>				
False Belief Trial	.166	15	.554	Small
<u>Faux Pas</u>				
Faux Pas-Faux Pas	-.253	15	.359	Small

Table 5: Neurologically Healthy - Correlations between WTAR Predicted WAIS-III VIQ and ToM tasks

ToM Task	<i>R</i>	<i>N</i>	<i>P</i> (two-tailed)	Effect
<u>Smarties</u>				
Belief-Self	-	15	-	-
Belief-Other	-	15	-	-
<u>Ice-Cream Van</u>				
Total Score	.337	15	.220	Medium
<u>Adapted Video-Based False Belief ToM Task</u>				
False Belief Trial	.084	15	.766	None
<u>Faux Pas</u>				
Faux Pas-Faux Pas	-.236	15	.398	Small

Table 6: Neurologically Healthy - Correlations between WTAR Predicted WAIS-III FSIQ and ToM tasks

ToM Task	<i>R</i>	<i>N</i>	<i>P</i> (two-tailed)	Effect
<u>Smarties</u>				
Belief-Self	-	15	-	-
Belief-Other	-	15	-	-
<u>Ice-Cream Van</u>				
Total Score	.449	15	.093	Medium
<u>Adapted Video-Based False Belief ToM Task</u>				
False Belief Trial	.195	15	.487	None
<u>Faux Pas</u>				
Faux Pas-Faux Pas	-.232	15	-.232	Small

Table 7: Independent t-test to explore difference in mean age for Neurologically Healthy Group and ABI group

Neurologically Healthy	Acquired Brain Injury	Neurologically Healthy Mean Age	Acquired Brain Injury Mean Age	<i>p</i> (two tailed)
<i>N</i>	<i>N</i>			
15	12	34.600	32.250	.496

Table 8: Performance on ToM Tasks for the Neurologically Healthy and Acquired Brain Injury Group

ToM Task	Neurologically Healthy	Acquired Brain Injury	Neurologically Healthy Mean	Acquired Brain Injury Mean	<i>p</i> (two tailed)
	<i>N</i>	<i>N</i>			
<u>Smarties</u>					
Belief-Self	15	12	1	1	-
Belief-Other	15	12	1	1	-
<u>Ice-Cream Van</u>					
Total Score	15	12	5.53	2.66	.076
<u>Adapted Video-Based False Belief ToM Task</u>					
False Belief Trial	15	12	9.66	5.41	.003*
<u>Faux Pas</u>					
Faux Pas-Faux Pas	15	12	85.53	65.91	.006*

** significance at .05 level*

Table 9: ABI Group – Correlations between Ice-Cream Van Task and tests of EF

EF Test	<i>r</i>	<i>N</i>	<i>P</i> two-tailed)	Effect
<u>MET-SV</u>				
Total Errors	-.476	12	.188	Medium
<u>BADS</u>				
Zoo Map	-.485	12	.110	Medium
Modified Six Elements	.310	11	.345	Medium
Age Corrected Standardised Score	.132	12	.698	Small
<u>DEX</u>				
DEX-Self	-.453	11	.139	Medium
DEX-Other	.490	11	.106	Medium
DEX-Other-Inhibition	.490	11	.106	Medium
DEX-Other-Intentionality	.172	11	.613	Small
DEX-Other-Executive	.168	11	.621	Small
<u>Memory</u>				
DEX-Other-Positive Affect	.146	11	.668	Small
DEX-Other-Negative Affect	-.223	11	.509	Small

Table 10: Neurologically Healthy Group – Correlations between Ice-Cream Van Task and tests of EF

EF Test	<i>r</i>	<i>N</i>	<i>P</i> (two-tailed)	Effect
<u>MET-SV</u>				
Total Errors	.350	15	.200	Medium
<u>BADS</u>				
Zoo Map	.712	15	.003**	Large
Modified Six Elements	-.012	15	.940	None
<u>DEX</u>				
DEX-Self	.220	15	.431	Small

*** significance at .01 level*

Table 11: Difference between the correlation coefficients between the Ice-Cream Van Task and tests of EF for both groups

	ABI	Neurologically	Difference	<i>p</i>
EF Test	<i>R</i>	Healthy		(two-tailed)
<u>MET-SV</u>				
Total Errors	-.476	.350	-3.67	.002**
<u>BADS</u>				
Zoo Map	-.485	.712	-2.053	.040*
Modified Six Elements	.310	-.012	.831	.406
<u>DEX</u>				
DEX-Self	-.453	.220	-1.738	.082

* significance at .05 level ** significance at .01 level

Table 12: ABI Group - Correlations between False Belief Trial on the Adapted Video-Based False Belief Task and tests of EF

	<i>r</i>	<i>N</i>	<i>P</i>	Effect
EF Test			(two-tailed)	
<u>MET-SV</u>				
Total Errors	-.528	12	.078	Large
<u>BADS</u>				
Zoo Map	.458	12	.134	Medium
Modified Six Elements	.267	11	.427	Small
Age Corrected Standardised Score	.510	12	.109	Large
<u>DEX</u>				
DEX-Self	.115	12	.721	Small
DEX-Other	.142	12	.659	Small
DEX-Other-Inhibition	-.183	11	.590	Small
DEX-Other-Intentionality	.183	11	.589	Small
DEX-Other-Executive	-.214	11	.528	Small
<u>Memory</u>				
DEX-Other-Positive Affect	.041	11	.905	Small
DEX-Other-Negative Affect	.085	11	.804	Small

Table 13: Neurologically Healthy Group - Correlations between False Belief Trail on the Adapted Video-Based False Belief Task and tests of EF

	<i>r</i>	<i>N</i>	<i>P</i>	Effect
EF Test			(two-tailed)	
<u>MET-SV</u>				
Total Errors	.258	15	.353	Small
<u>BADS</u>				
Zoo Map	.490	15	.064	Medium
Modified Six Elements	.357	15	.191	Medium
<u>DEX</u>				
DEX-Self	-.246	15	.376	Small

Table 14: Difference between the correlation coefficients between the False Belief Trial on the Adapted Video-Based False Belief and tests of EF for both groups

	ABI	Neurologically	Difference	<i>p</i>
EF Test	<i>r</i>	Healthy	<i>z</i>	(two-tailed)
		<i>r</i>		
<u>MET-SV</u>				
Total Errors	-.528	.258	-2.029	.042*
<u>BADS</u>				
Zoo Map	.458	.490	-.083	.934
Modified Six Elements	.267	.357	-.232	.816
<u>DEX</u>				
DEX-Self	.115	-.246	.932	.351

* significance at .05 level

Table 15: ABI Group - Correlations between Faux Pas questions-Faux Pas Stories- Faux Pas Task and tests of EF

	<i>r</i>	<i>N</i>	<i>P</i>	Effect
EF Test			(two-tailed)	
<u>MET-SV</u>				
Total Errors	-.543	12	.068	Large
<u>BADS</u>				
Zoo Map	.209	12	.514	Small
Modified Six Elements	.510	11	.109	Large
Age Corrected	.796	12	.003**	Large
Standardised Score				
<u>DEX</u>				
DEX-Self	.272	12	.393	Small
DEX-Other	-.316	12	.317	Medium
DEX-Other-Inhibition	-.313	11	.349	Medium
DEX-Other-Intentionality	-.414	11	.205	Medium
DEX-Other-Executive	-.303	11	.365	Medium
Memory				
DEX-Other-Positive Affect	-.169	11	.620	Small
DEX-Other-Negative Affect	-.119	11	.728	Small

**** significance at .01 level**

Table 16: Neurologically Healthy Group - Correlations between Faux Pas questions on the Faux Pas Stories of the Faux Pas Task and tests of EF

	<i>r</i>	<i>N</i>	<i>P</i>	Effect
EF Test			(two-tailed)	
<u>MET-SV</u>				
Total Errors	-.290	15	.294	Small
<u>BADS</u>				
Zoo Map	.309	15	.263	Medium
Modified Six Elements	.417	15	.122	Medium
<u>DEX</u>				
DEX-Self	.037	15	.897	Small

Table 17: Difference between the correlation coefficients between the Faux Pas questions on the Faux Pas Stories of the Faux Pas Task and tests of EF for both groups

	ABI	Neurologically	Difference	<i>p</i>
EF Test	<i>r</i>	Healthy	<i>z</i>	(two-tailed
		<i>r</i>		
<u>MET-SV</u>				
Total Errors	-.543	-.290	.653	.514
<u>BADS</u>				
Zoo Map	.209	.309	-2.58	.796
Modified Six Elements	.510	.417	.240	.810
<u>DEX</u>				
DEX-Self	.272	.037	.607	.544

Appendix M Ethical Approval

- Coventry University**
- Leicestershire, Northamptonshire &
Rutland Research Ethics Committee 1**
- St Andrews Healthcare Ethics
Committee**

Memorandum

Coventry University

**Faculty of Health & Life Sciences
Coventry University Ethics Committee**

To Jennifer Churchley		From Satwant Sandhu (Mrs) Ethics Administrator	
cc	Email: s.sandhu@coventry.ac.uk		
	Tel. No: 024 7679 5813	Delivery Point RCG17	
	Our Reference PG73/09		
		Date 7 May 2008	

Subject: Ethics Application – Title: Executive Function and Theory of Mind In Adults with Brain Injury

Thank you for submitting your application to Coventry University Ethics Committee.

I am pleased to inform you that your application was approved on 28 August 2007. Please find a completed Peer Review Form for your reference.

Best wishes with your research project.

National Research Ethics Service

Leicestershire, Northamptonshire & Rutland Research Ethics Committee 1

1 Standard Court
Park Row
Nottingham
NG1 6GN

Tel: 0115 9123344 ext 39428
Fax: 0115 9123300

25 October 2007

Miss Jennifer Churchley
Trainee Clinical Psychologist
Clinical Psychology Doctorate
Coventry University
Priory Street
CV1 5FB

Dear Miss Churchley,

Study title:	Executive Function and Theory of Mind in Adults with Brain Injury
REC reference:	07/H0406/218
Protocol number:	3
Amendment number:	2
Amendment date:	25 October 2007

Thank you for your letter of 25 October 2007, notifying the Committee of the above amendment.

The Committee does not consider this to be a "substantial amendment" as defined in the Standard Operating Procedures for Research Ethics Committees. The amendment does not therefore require an ethical opinion from the Committee and may be implemented immediately, provided that it does not affect the approval for the research given by the R&D office for the relevant NHS care organisation.

Documents received

The documents received were as follows:

Document	Version	Date
Participant Information Sheet: Clinical Participants	3	01 October 2007
Participant Information Sheet: Non-Clinical Participants	3	01 October 2007
Participant Consent Form: Clinical Participants	3	01 October 2007
Participant Consent Form: Non-Clinical Participants	2	01 October 2007
Notification of a Minor Amendment	2	25 October 2007

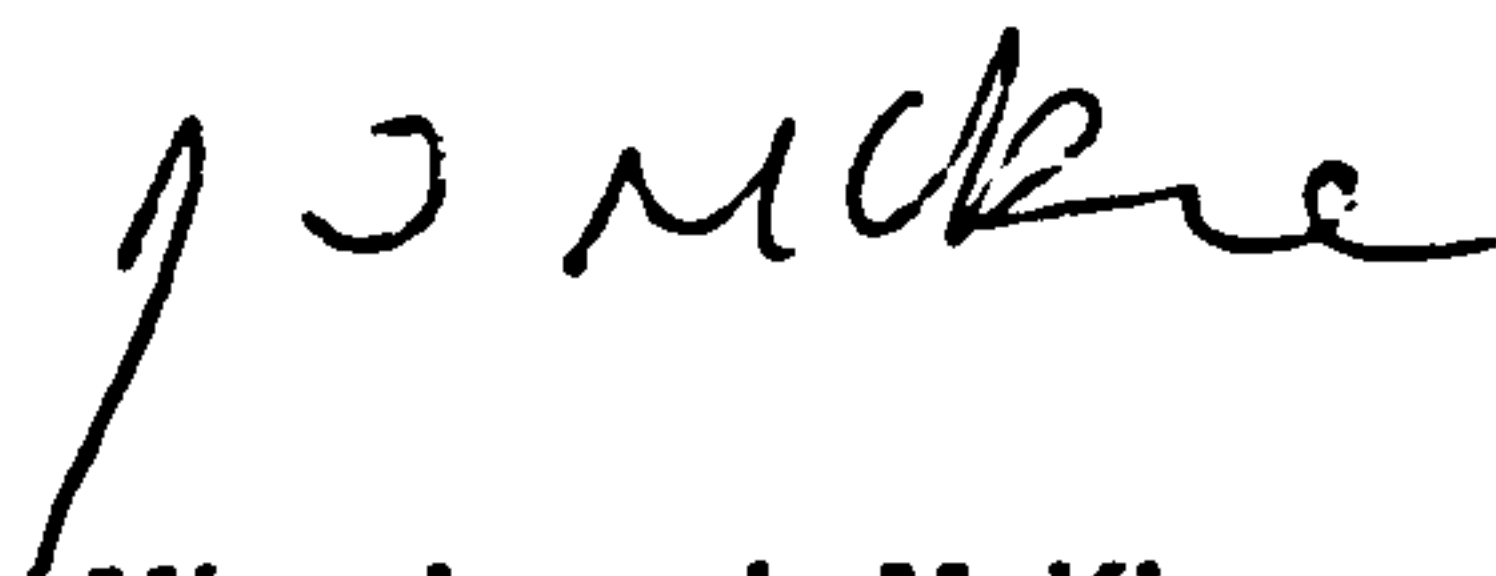
Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees (July 2001) and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

07/H0406/218:

Please quote this number on all correspondence

Yours sincerely,



Miss Jeannie McKie
Committee Co-ordinator

E-mail: jeannie.mckie@nottspct.nhs.uk

Copy to:

Coventry University
R&D office for NHS care organisation at lead site - UHL



28 January 2008

Jennifer Churchley
Trainee Clinical Psychologist
Clinical Psychology Doctorate
Coventry University
Priory Street
Coventry
CV1 5FB

Dear Jennifer

Re: Executive function and theory of mind in adults with brain injury

This is to confirm that I have received notification of the following:

- Confirmation from your University that they will sponsor the project
- Confirmation of ethical approval from an appropriate NHS Research Ethics Committee

This is all the paperwork I need.

The Research Department may request a progress report during the course of the study and will require a copy of the final report upon completion.

Yours sincerely

Geoff Dickens
Research Coordinator

Cc Anita Boothby



Jenny Churchley

From: Geoff Dickens
Sent: 24 October 2007 17:48
To: Jenny Churchley
Cc: Jan Crawford
Subject: RE: ethics

Hi Jenny

Thanks for these documents, also for forwarding the decision of the ethics committee which is now on file. I will add you to our active research log and write to the relevant service director to let them know you have all the necessary approvals in place. I'll send out a standard letter to confirm this in writing. We will require notification of the end of the study and a copy of the final report for our records. Good luck

regards

Geoff

15/04/2008